



REPORT No. 7
JULY, 2000

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This monthly report contains a comparison of Two-way Satellite Time Transfer (TW), Common-view Time Transfer (CV), and Carrier-Phase Time/Frequency Transfer (CP) data analyzed at USNO. Time transfer data is tabulated and analyzed in a one-point-per-day format for the list of timing labs given below. Because we currently process TW data only for those baselines which include USNO, not every baseline combination of these labs is included in this report.

AMC Colorado Springs, Colorado U.S.A
NPL Teddington, Middlesex, UK
PTB Braunschweig, Germany
USNO Washington, D.C. USA

HOW THE TABLES ARE CALCULATED

For each baseline, time-transfer data are collected from each of the TW, CV, and CP analysis groups at USNO. To each data time series, a one-day linear fit is made. From this fit, a value for time-transfer is selected which corresponds to an epoch at which a TW data point exists. For those days without TW data, the CP and CV time-transfer value is related to 12:00 UTC. Also, the RMS scatter about each linear fit is given in the table.

Following each table are graphs of TW-CV, TW-CP, and CV-CP differences. Error bars are drawn on each data point reflecting an RSS combination of the RMS values obtained from the linear fits to each TW, CV, and CP time series. Though the tables in each report will consist of one month of data, the graphs will be cumulative until one year of data is collected, after which the graphs will consist of a one-year moving window.

Basic hardware configurations at each site are provided at the end of the report. Because some sites may have more than one receiver/modem, a separate designation has been specified for each receiver combination. For example, the report includes 8 designations for USNO (e.g. USNO(a), USNO(b), ..., USNO(h)) where each designation corresponds to a different combination of CV, CP, and TW receivers/modems. Since each designation represents a combination of TW, CV, and CP receivers/modems, these hardware configuration tables will be somewhat redundant. For example, USNO(a) and USNO(b) differ only in the choice of CV receiver (i.e. the TW and CP hardware are the same for USNO(a) and USNO(b)).

NOTE: Currently, the following site combinations are such that CP receivers are NOT on the same reference standard as the CV and TW hardware: USNO(a), USNO(b), PTB, TUG. However, the USNO(a) and USNO(b) clock estimates are re-referenced to the same timing reference as the CV and TW hardware using an optic fiber link. Also, CP clock estimates at PTB are referenced to the same timing reference as CV and TW data using data from a SRS620 time-interval counter.

ADJUSTMENTS TO THE DATA

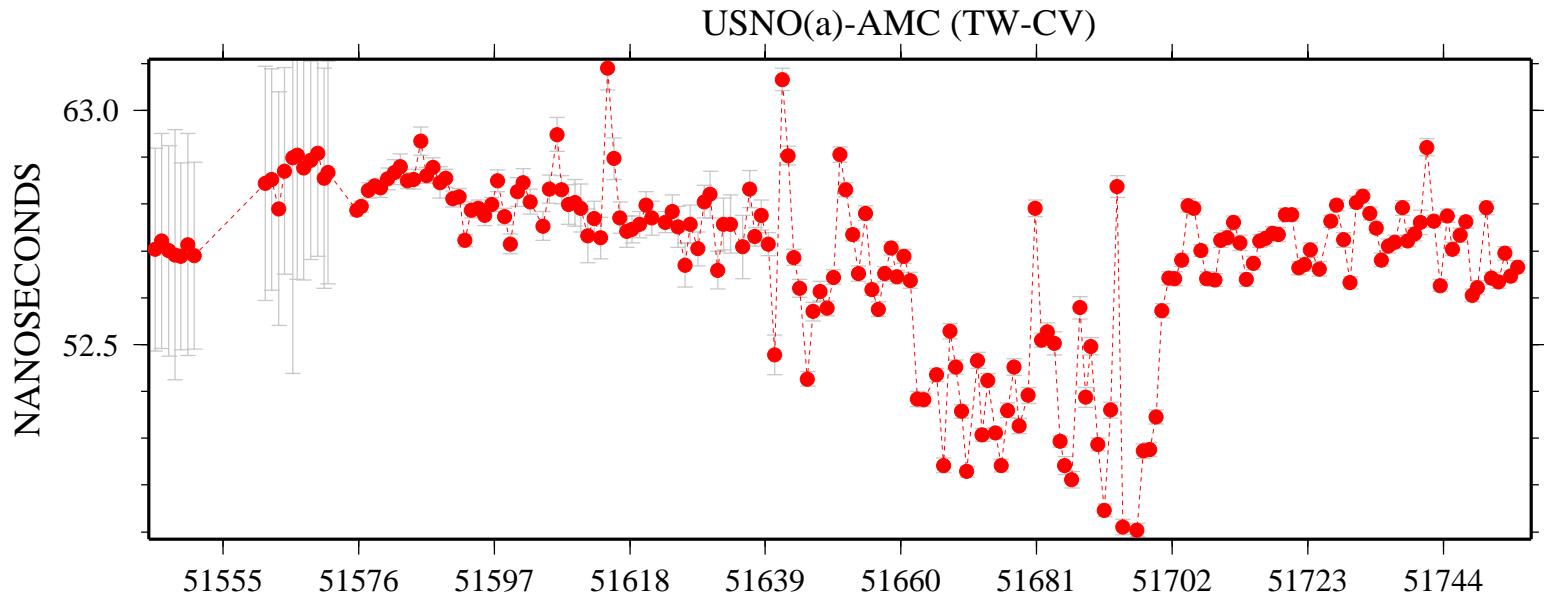
Each table contains a column marked ADJUSTMENTS which indicate any manual adjustments made to the data. For example, we currently remove arbitrary values from the non-calibrated carrier-phase systems to account for receiver resets which can occur for example when a receiver's power is cycled. In particular, first differences of the carrier-phase estimates are taken and spikes larger than 10ns (accounting for large data gaps) are flagged as outliers. Flagged values are then replaced by linearly interpolating adjacent first differences. Finally, the series of first differences is then integrated back into the time domain by choosing an initial arbitrary constant so that all CP values are 0.000 on January 1, 2000. For these carrier-phase adjustments, the ADJUSTMENTS column represents the difference between the raw and the "cleaned" CP data, and is therefore a measure of the individual jumps removed. This is clearly not the optimal method of removing such jumps since some carrier-phase systems track a 1-pps input from the local reference which can be used to re-reference the receiver's internal clock to the external reference when such resets occur. However, since we do not have available such 1-pps for most of the non-USNO sites, we have opted instead to remain consistent and remove carrier-phase jumps according to this very simplistic method.

USNO(a) - AMC

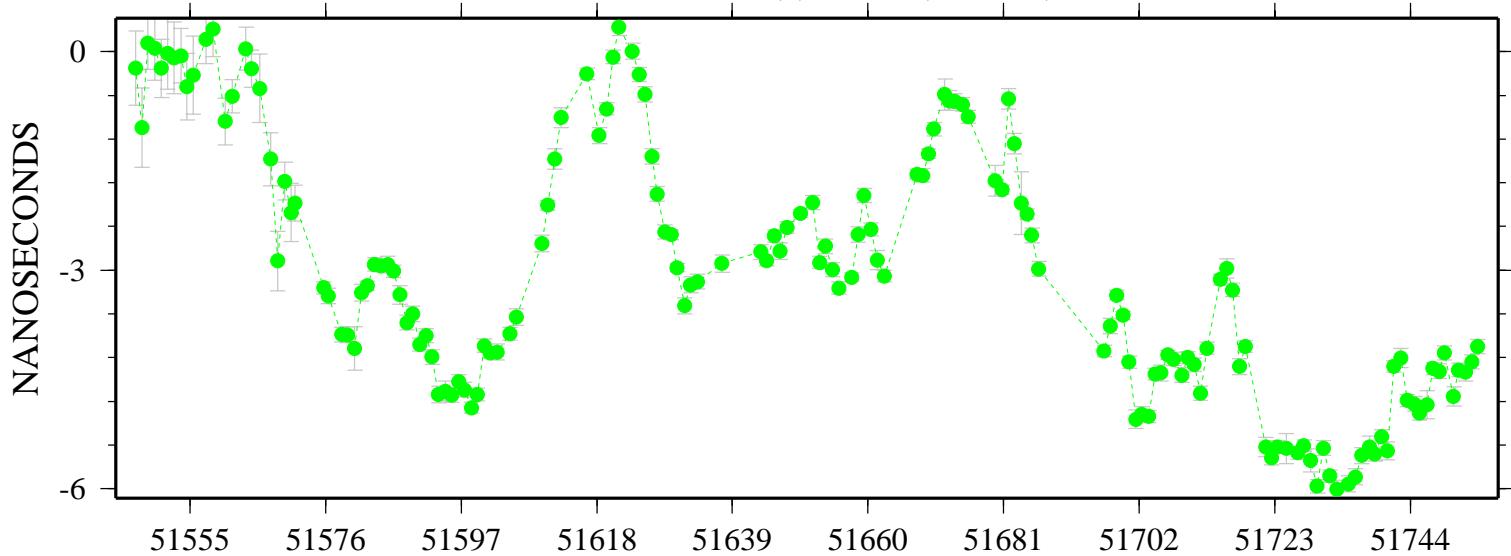
| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|-------|-------------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5365 | -0.3 | -58.3 | 5.242 | - 928.901 _{CP} | 58.0 | -5.5 | -63.5 | 0.1 | 0.3 | 0.005 |
| 51727.5140 | -0.3 | -59.1 | 5.103 | | 58.7 | -5.4 | -64.2 | 0.1 | 0.2 | 0.004 |
| 51728.5556 | -0.6 | -57.8 | 4.968 | | 57.2 | -5.6 | -62.8 | 0.2 | 0.3 | 0.003 |
| 51729.5979 | -0.9 | -56.2 | 5.086 | | 55.3 | -6.0 | -61.2 | 0.1 | 0.3 | 0.004 |
| 51730.5142 | -0.4 | -59.3 | 5.017 | | 58.9 | -5.4 | -64.3 | 0.1 | 0.3 | 0.003 |
| 51731.4931 | -0.7 | -59.9 | 5.115 | | 59.2 | -5.8 | -65.0 | 0.1 | 0.3 | 0.002 |
| 51732.6601 | -0.9 | -59.3 | 5.091 | | 58.4 | -6.0 | -64.4 | 0.1 | 0.3 | 0.004 |
| 51733.5972 | -0.3 | -58.0 | 0.245 | | 57.7 | -0.5 | -58.2 | 0.1 | 0.2 | Inf |
| 51734.4101 | -0.9 | -57.2 | 5.021 | + 146.731 _{CP} | 56.3 | -5.9 | -62.2 | 0.1 | 0.3 | 0.003 |
| 51735.4948 | -0.7 | -57.7 | 5.101 | - 374.683 _{CP} | 56.9 | -5.8 | -62.8 | 0.1 | 0.3 | 0.002 |
| 51736.5139 | -0.4 | -57.5 | 5.136 | | 57.1 | -5.5 | -62.6 | 0.1 | 0.3 | 0.002 |
| 51737.7014 | -0.1 | -58.7 | 5.374 | | 58.6 | -5.4 | -64.1 | 0.1 | 0.3 | 0.002 |
| 51738.5136 | 0.1 | -57.0 | 5.647 | | 57.1 | -5.5 | -62.7 | 0.1 | 0.2 | 0.003 |
| 51739.5556 | 0.4 | -57.0 | 5.701 | | 57.5 | -5.3 | -62.7 | 0.1 | 0.3 | 0.004 |
| 51740.4511 | 0.3 | -57.7 | 5.742 | | 58.0 | -5.5 | -63.5 | 0.1 | 0.5 | 0.008 |
| 51741.4719 | 0.8 | -60.6 | 5.093 | | 61.3 | -4.3 | -65.7 | 0.1 | 0.4 | 0.002 |
| 51742.4927 | 0.7 | -57.4 | 4.871 | | 58.0 | -4.2 | -62.2 | 0.1 | 0.2 | 0.004 |
| 51743.5553 | 0.2 | -55.0 | 4.942 | | 55.2 | -4.8 | -59.9 | 0.1 | 0.3 | 0.004 |
| 51744.6593 | -0.1 | -58.4 | 4.739 | | 58.3 | -4.8 | -63.1 | 0.1 | 0.3 | 0.002 |
| 51745.3677 | -0.3 | -57.1 | 4.686 | + 196.939 _{CP} | 56.8 | -5.0 | -61.7 | 0.1 | 0.3 | 0.003 |
| 51746.5758 | 0.0 | -57.4 | 4.808 | | 57.4 | -4.8 | -62.3 | 0.2 | 0.3 | 0.003 |
| 51747.5344 | 0.6 | -57.4 | 4.908 | | 58.0 | -4.3 | -62.4 | 0.1 | 0.3 | 0.003 |
| 51748.4719 | 0.7 | -54.0 | 5.135 | | 54.7 | -4.4 | -59.1 | 0.1 | 0.3 | 0.004 |
| 51749.2428 | 0.9 | -54.2 | 4.999 | | 55.1 | -4.1 | -59.2 | 0.1 | 0.3 | 0.003 |
| 51750.7011 | 0.2 | -58.5 | 4.885 | | 58.6 | -4.7 | -63.4 | 0.1 | 0.3 | 0.003 |
| 51751.4927 | 0.5 | -55.0 | 4.864 | | 55.5 | -4.4 | -59.8 | 0.1 | 0.2 | 0.003 |
| 51752.5559 | 0.4 | -54.9 | 4.853 | | 55.3 | -4.4 | -59.7 | 0.1 | 0.3 | 0.008 |
| 51753.5344 | 0.7 | -55.9 | 4.973 | | 56.6 | -4.3 | -60.9 | 0.1 | 0.3 | 0.004 |
| 51754.4511 | 0.8 | -54.8 | 4.849 | | 55.6 | -4.0 | -59.6 | 0.1 | 0.3 | 0.004 |
| 51755.5351 | 0.9 | -55.1 | | | 56.0 | | | 0.1 | 0.3 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

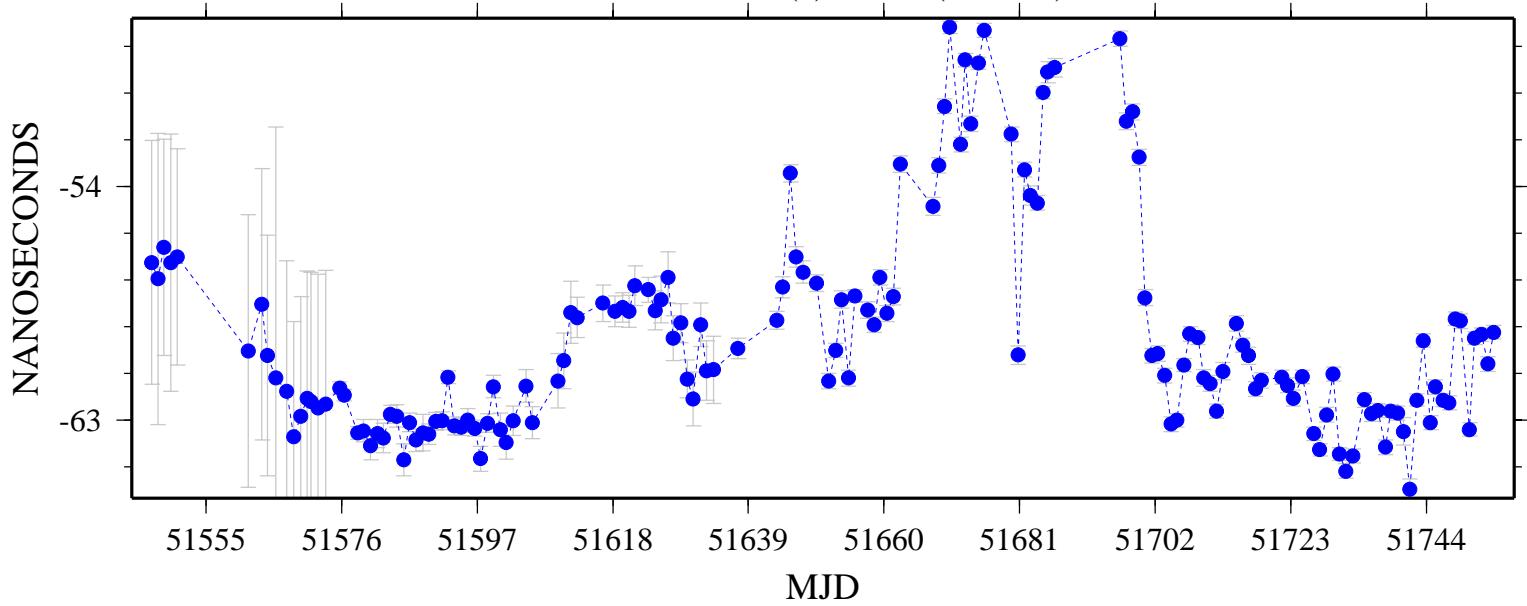
USNO(a)-AMC (TW-CV)



USNO(a)-AMC (TW-CP)



USNO(a)-AMC (CV-CP)



USNO(b) - NPL

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|------|---------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | 7.9 | -85.821 | | | | 93.7 | | 1.3 | 0.006 |
| 51727.5000 | | 9.3 | -86.024 | | | | 95.3 | | 1.4 | 0.008 |
| 51728.6097 | 3.8 | 11.0 | -86.456 | | -7.2 | 90.3 | 97.5 | 0.4 | 0.9 | 0.006 |
| 51729.5000 | | 15.4 | -86.631 | | | | 102.0 | | 1.2 | 0.006 |
| 51730.6098 | 5.5 | 10.8 | -87.185 | | -5.3 | 92.6 | 98.0 | 0.5 | 1.0 | 0.008 |
| 51731.5000 | | 7.3 | -87.542 | | | | 94.8 | | 1.1 | 0.005 |
| 51732.5000 | | 8.1 | -88.196 | | | | 96.3 | | 1.0 | 0.006 |
| 51733.5000 | | 11.8 | -88.769 | | | | 100.5 | | 1.3 | 0.004 |
| 51734.5000 | | 10.7 | -89.010 | | | | 99.7 | | 1.3 | 0.003 |
| 51735.6097 | 4.7 | 9.6 | -89.200 | | -4.9 | 93.9 | 98.8 | 0.6 | 1.6 | 0.004 |
| 51736.5000 | | 9.1 | -89.593 | | | | 98.7 | | 1.5 | 0.004 |
| 51737.6097 | 4.7 | 6.4 | -89.635 | | -1.7 | 94.4 | 96.1 | 0.4 | 1.5 | 0.005 |
| 51738.5000 | | 4.9 | -89.705 | | | | 94.6 | | 1.4 | 0.004 |
| 51739.6097 | 4.3 | 8.6 | -90.020 | | -4.3 | 94.3 | 98.6 | 0.3 | 1.7 | 0.004 |
| 51740.5000 | | 9.9 | -90.241 | | | | 100.1 | | 1.5 | 0.005 |
| 51741.5000 | | 7.5 | -90.677 | | | | 98.2 | | 1.3 | 0.005 |
| 51742.6097 | 2.7 | 3.6 | -90.971 | | -0.9 | 93.6 | 94.5 | 0.3 | 1.4 | 0.007 |
| 51743.5000 | | 5.0 | -90.677 | | | | 95.7 | | 1.1 | 0.015 |
| 51744.6097 | 2.0 | 0.9 | -90.911 | | 1.1 | 92.9 | 91.8 | 0.3 | 2.6 | 0.008 |
| 51745.5000 | | | -91.082 | + 196.964cp | | | | | | 0.005 |
| 51746.6097 | 1.5 | | -91.129 | | | 92.6 | | 0.4 | | 0.005 |
| 51747.5000 | | | -93.407 | | | | | | | 0.210 |
| 51748.5000 | | 14.3 | -91.700 | | | | 106.0 | | 1.6 | 0.006 |
| 51749.6097 | 2.5 | 14.7 | -91.884 | | -12.2 | 94.4 | 106.6 | 0.4 | 1.1 | 0.003 |
| 51750.5000 | | 6.7 | -91.854 | | | | 98.6 | | 1.6 | 0.003 |
| 51751.6097 | 2.0 | 8.6 | -91.888 | | -6.6 | 93.9 | 100.5 | 0.4 | 2.0 | 0.005 |
| 51752.5000 | | 9.6 | -91.708 | | | | 101.3 | | 1.1 | 0.008 |
| 51753.6097 | 2.9 | 7.8 | -91.249 | | -4.9 | 94.1 | 99.0 | 0.5 | 1.6 | 0.005 |
| 51754.5000 | | 5.1 | -91.316 | | | | 96.4 | | 1.5 | 0.005 |
| 51755.5000 | | 9.7 | | | | | | | 1.3 | |

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USNO(b)-NPL (TW-CV)

NANOSECONDS

0.0
-11.5

51555 51576 51597 51618 51639 51660 51681 51702 51723 51744

USNO(b)-NPL (TW-CP)

NANOSECONDS

103.5
92.0

51555 51576 51597 51618 51639 51660 51681 51702 51723 51744

USNO(b)-NPL (CV-CP)

NANOSECONDS

103.5
92.0

51555 51576 51597 51618 51639 51660 51681 51702 51723 51744

MJD

x and y-axes are same scale

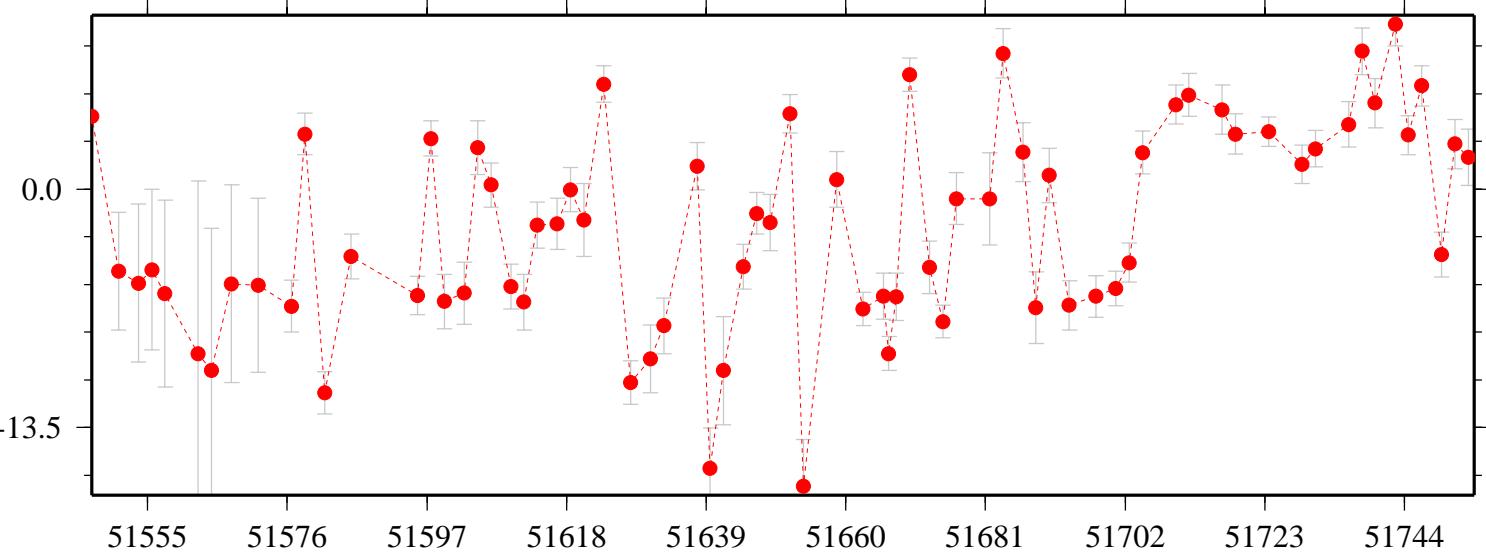
USNO(b) - PTB

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|--------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | -6.2 | | | | | | | 0.8 | |
| 51727.5000 | | -2.2 | | | | | | | 1.4 | |
| 51728.6160 | 1.3 | -0.1 | | | 1.4 | | | 0.6 | 0.9 | |
| 51729.5000 | | 3.1 | | | | | | | 1.0 | |
| 51730.6160 | 2.6 | 0.3 | 33.235 | - 283.390cp | 2.3 | -30.7 | -32.9 | 0.7 | 0.8 | 0.016 |
| 51731.5000 | | -2.8 | 32.150 | | | | -35.0 | | 0.9 | 0.025 |
| 51732.5000 | | -3.2 | 31.130 | | | | -34.4 | | 0.9 | 0.020 |
| 51733.5000 | | -0.3 | 29.616 | | | | -29.9 | | 1.1 | 0.017 |
| 51734.5000 | | -0.7 | 30.342 | | | | -31.0 | | 1.6 | 0.022 |
| 51735.6160 | -0.4 | -4.1 | 30.621 | | 3.7 | -31.0 | -34.7 | 0.6 | 1.1 | 0.026 |
| 51736.5000 | | -4.0 | 30.061 | | | | -34.1 | | 0.8 | 0.027 |
| 51737.6160 | 1.4 | -6.4 | | | 7.8 | | | 0.6 | 1.2 | |
| 51738.5000 | | -7.9 | 28.376 | + 1.511cp | | | -36.3 | | 0.8 | 0.014 |
| 51739.6160 | -0.3 | -5.2 | 28.035 | | 4.9 | -28.3 | -33.2 | 0.5 | 1.3 | 0.024 |
| 51740.5000 | | -0.9 | 29.246 | | | | -30.1 | | 1.6 | 0.033 |
| 51741.5000 | | -3.3 | 28.578 | | | | -31.8 | | 1.1 | 0.019 |
| 51742.6160 | 0.7 | -8.6 | 26.530 | | 9.3 | -25.8 | -35.2 | 0.5 | 1.1 | 0.021 |
| 51743.5000 | | -8.2 | | | | | | | 1.1 | |
| 51744.6160 | -2.8 | -5.9 | 25.783 | - 0.105cp | 3.1 | -28.6 | -31.7 | 0.6 | 0.9 | 0.011 |
| 51745.5000 | | -4.7 | 24.341 | + 196.862cp | | | -29.0 | | 0.9 | 0.031 |
| 51746.6160 | -4.9 | -10.8 | 23.320 | | 5.9 | -28.3 | -34.1 | 0.7 | 0.9 | 0.020 |
| 51747.5000 | | -9.7 | 22.344 | - 1.212cp | | | -32.0 | | 0.7 | 0.374 |
| 51748.5000 | | -0.7 | 21.880 | | | | -22.5 | | 1.3 | 0.022 |
| 51749.6160 | -6.5 | -2.8 | 21.101 | | -3.7 | -27.6 | -23.9 | 0.6 | 1.1 | 0.017 |
| 51750.5000 | | -10.0 | 21.452 | | | | -31.5 | | 1.3 | 0.013 |
| 51751.6160 | -6.7 | -9.2 | 20.292 | | 2.6 | -26.9 | -29.5 | 0.6 | 1.3 | 0.017 |
| 51752.5000 | | -8.5 | 20.316 | | | | -28.8 | | 1.0 | 0.015 |
| 51753.6160 | -7.4 | -9.2 | 20.937 | | 1.8 | -28.3 | -30.1 | 1.0 | 1.3 | 0.022 |
| 51754.5000 | | -11.9 | 20.338 | | | | -32.2 | | 1.2 | 0.018 |
| 51755.5000 | | -6.3 | | | | | | | 0.9 | |

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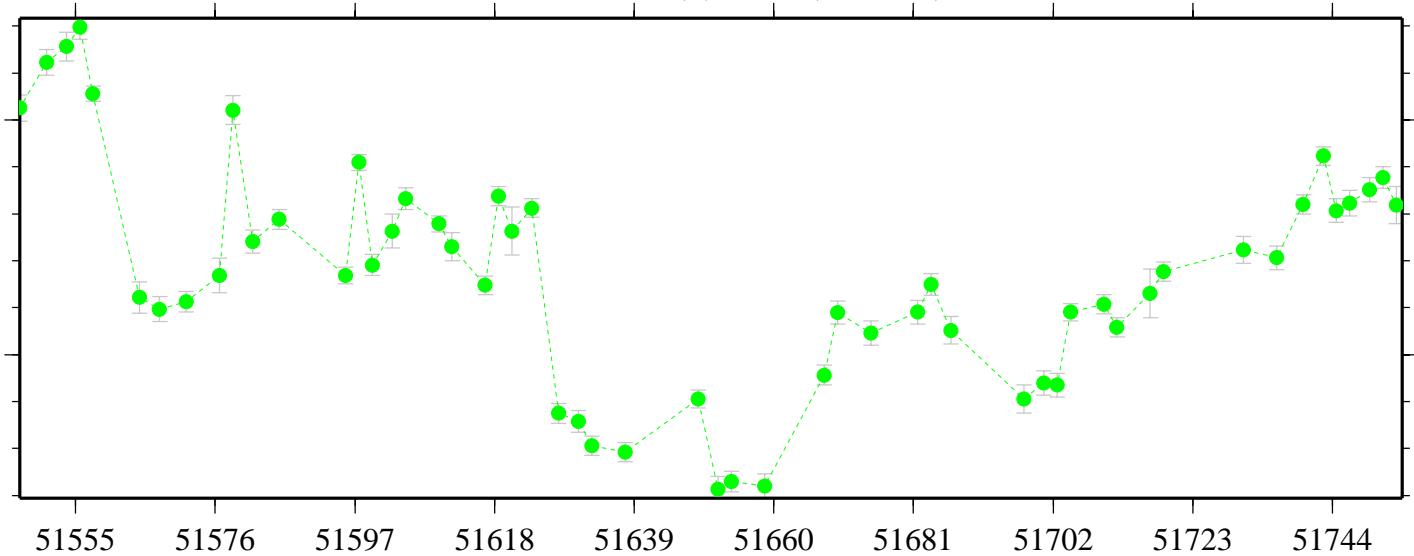
USNO(b)-PTB (TW-CV)

NANOSECONDS



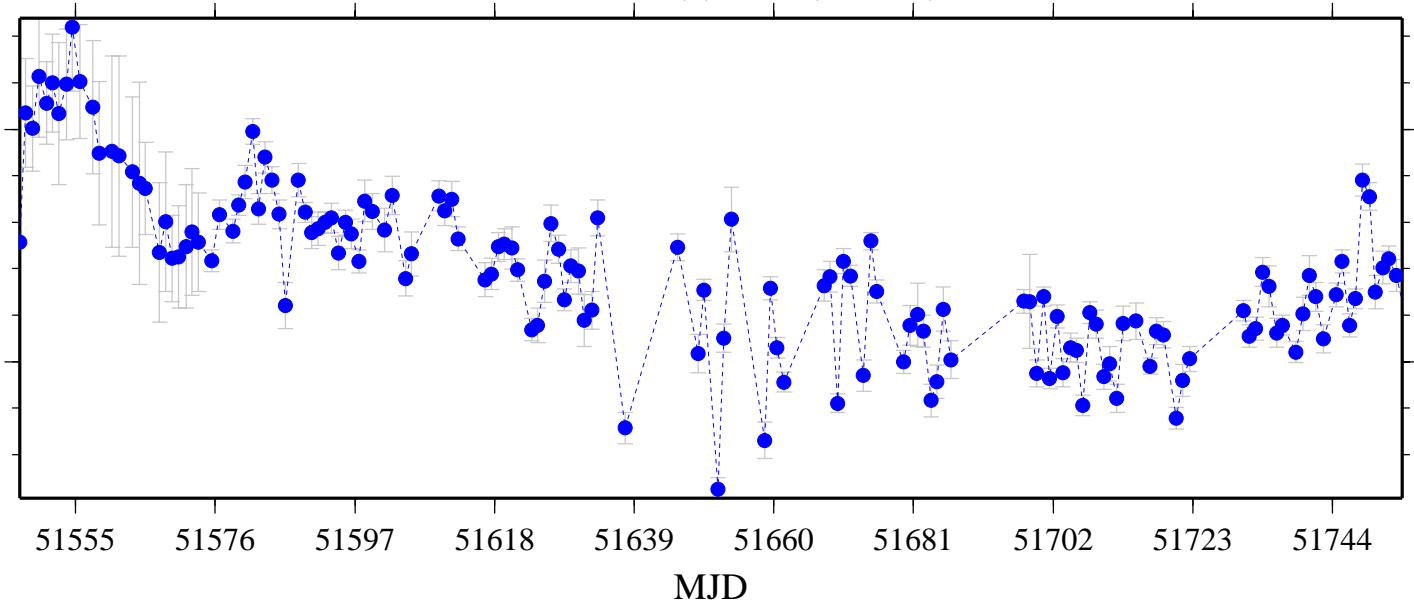
USNO(b)-PTB (TW-CP)

NANOSECONDS



USNO(b)-PTB (CV-CP)

NANOSECONDS

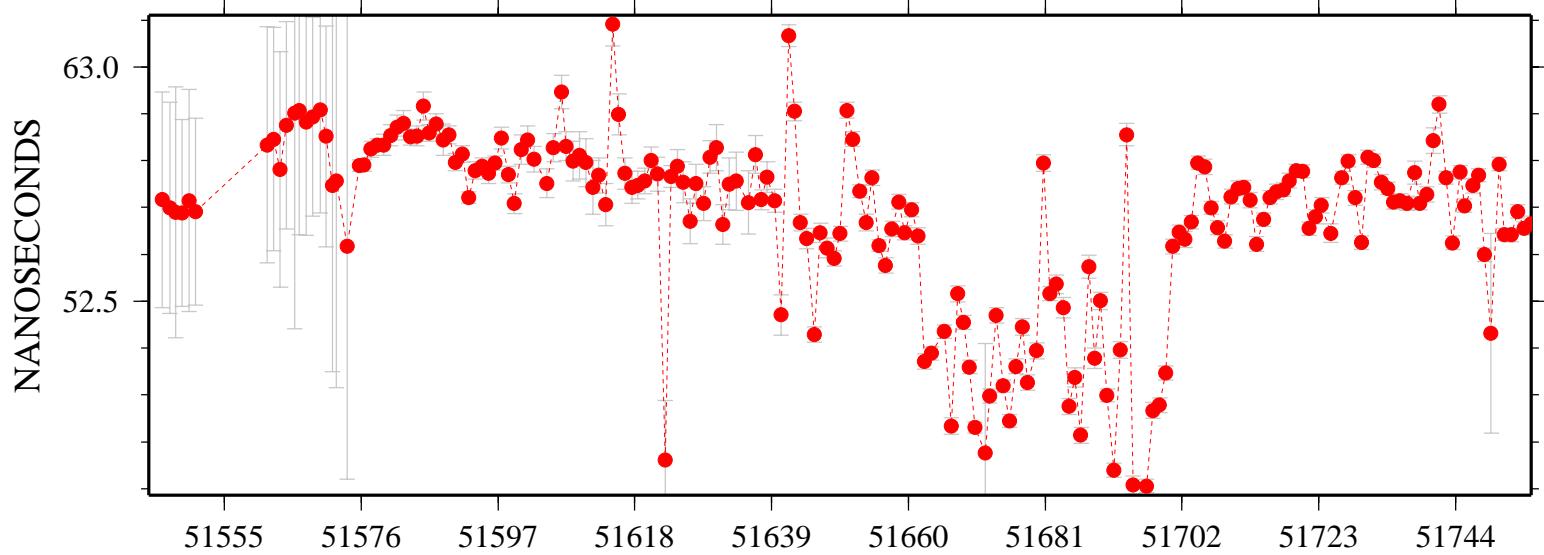


USNO(c) - AMC

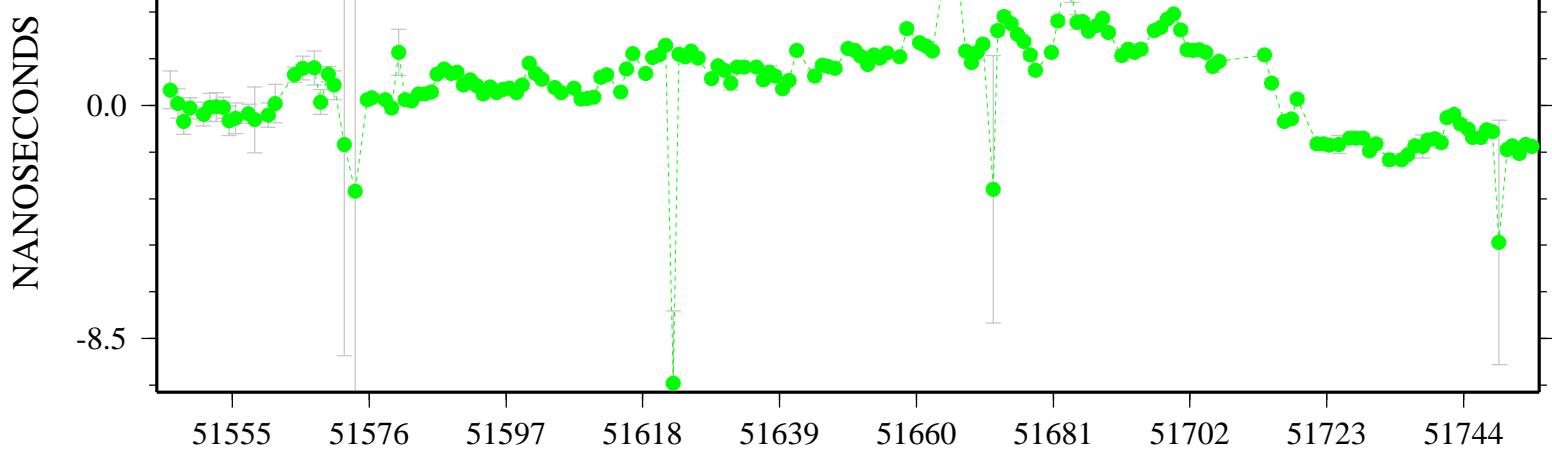
| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|-------|-------------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5563 | -0.4 | -58.4 | 0.812 | - 929.120 _{CP} | 58.0 | -1.2 | -59.2 | 0.1 | 0.3 | 0.003 |
| 51727.5351 | -0.4 | -59.2 | 0.785 | | 58.8 | -1.2 | -60.0 | 0.1 | 0.2 | 0.003 |
| 51728.5351 | -0.6 | -57.8 | 0.574 | | 57.1 | -1.2 | -58.3 | 0.2 | 0.3 | 0.004 |
| 51729.5782 | -1.0 | -56.1 | 0.638 | | 55.1 | -1.7 | -56.8 | 0.1 | 0.3 | 0.003 |
| 51730.5344 | -0.6 | -59.6 | 0.792 | | 59.0 | -1.4 | -60.4 | 0.2 | 0.3 | 0.003 |
| 51731.4518 | -0.8 | -59.6 | | | 58.8 | | | 0.1 | 0.3 | |
| 51732.5768 | -1.1 | -59.0 | 0.859 | | 57.8 | -2.0 | -59.8 | 0.2 | 0.3 | 0.002 |
| 51733.5972 | -0.4 | -58.0 | | | 57.6 | | | 0.2 | 0.2 | |
| 51734.4719 | -1.0 | -58.0 | 0.966 | + 146.892 _{CP} | 56.9 | -2.0 | -58.9 | 0.1 | 0.3 | 0.002 |
| 51735.4948 | -0.7 | -57.7 | 1.134 | - 375.075 _{CP} | 57.0 | -1.8 | -58.8 | 0.1 | 0.3 | 0.004 |
| 51736.5139 | -0.6 | -57.5 | 0.842 | | 56.9 | -1.5 | -58.3 | 0.2 | 0.3 | 0.002 |
| 51737.7024 | -0.4 | -58.7 | 1.075 | | 58.3 | -1.5 | -59.8 | 0.4 | 0.3 | 0.003 |
| 51738.4927 | 0.0 | -56.9 | 1.249 | | 56.9 | -1.3 | -58.1 | 0.1 | 0.2 | 0.002 |
| 51739.5556 | 0.3 | -57.0 | 1.479 | | 57.3 | -1.2 | -58.5 | 0.2 | 0.3 | 0.002 |
| 51740.5351 | 0.2 | -59.5 | 1.533 | | 59.7 | -1.3 | -61.1 | 0.2 | 0.5 | 0.018 |
| 51741.4926 | 0.8 | -60.6 | 1.189 | | 61.3 | -0.4 | -61.8 | 0.1 | 0.4 | 0.003 |
| 51742.5556 | 0.8 | -57.3 | 1.093 | | 58.0 | -0.3 | -58.4 | 0.2 | 0.2 | 0.004 |
| 51743.5553 | 0.1 | -55.0 | 0.790 | | 55.1 | -0.7 | -55.8 | 0.1 | 0.3 | 0.004 |
| 51744.6593 | -0.1 | -58.4 | 0.772 | | 58.3 | -0.9 | -59.1 | 0.1 | 0.3 | 0.003 |
| 51745.3677 | -0.3 | -57.1 | 0.885 | | 56.8 | -1.2 | -57.9 | 0.1 | 0.3 | 0.003 |
| 51746.6171 | 0.0 | -57.7 | 1.182 | | 57.7 | -1.2 | -58.9 | 0.2 | 0.3 | 0.003 |
| 51747.5552 | 0.5 | -57.6 | 1.428 | | 58.1 | -0.9 | -59.0 | 0.1 | 0.3 | 0.003 |
| 51748.4511 | 0.7 | -53.9 | 1.613 | | 54.6 | -1.0 | -55.5 | 0.1 | 0.3 | 0.002 |
| 51749.4511 | -3.4 | -54.4 | 1.651 | | 51.1 | -5.0 | -56.1 | 4.5 | 0.3 | 0.003 |
| 51750.7011 | 0.2 | -58.5 | 1.779 | | 58.6 | -1.6 | -60.3 | 0.1 | 0.3 | 0.002 |
| 51751.4927 | 0.5 | -55.0 | 1.985 | | 55.5 | -1.5 | -57.0 | 0.1 | 0.2 | 0.003 |
| 51752.5761 | 0.4 | -55.0 | 2.182 | | 55.5 | -1.7 | -57.2 | 0.2 | 0.3 | 0.003 |
| 51753.5143 | 0.8 | -55.7 | 2.225 | | 56.5 | -1.4 | -57.9 | 0.1 | 0.3 | 0.003 |
| 51754.4927 | 0.9 | -54.9 | 2.397 | | 55.8 | -1.5 | -57.3 | 0.1 | 0.3 | 0.003 |
| 51755.5556 | 0.7 | -55.3 | | | 56.0 | | | 0.2 | 0.3 | |

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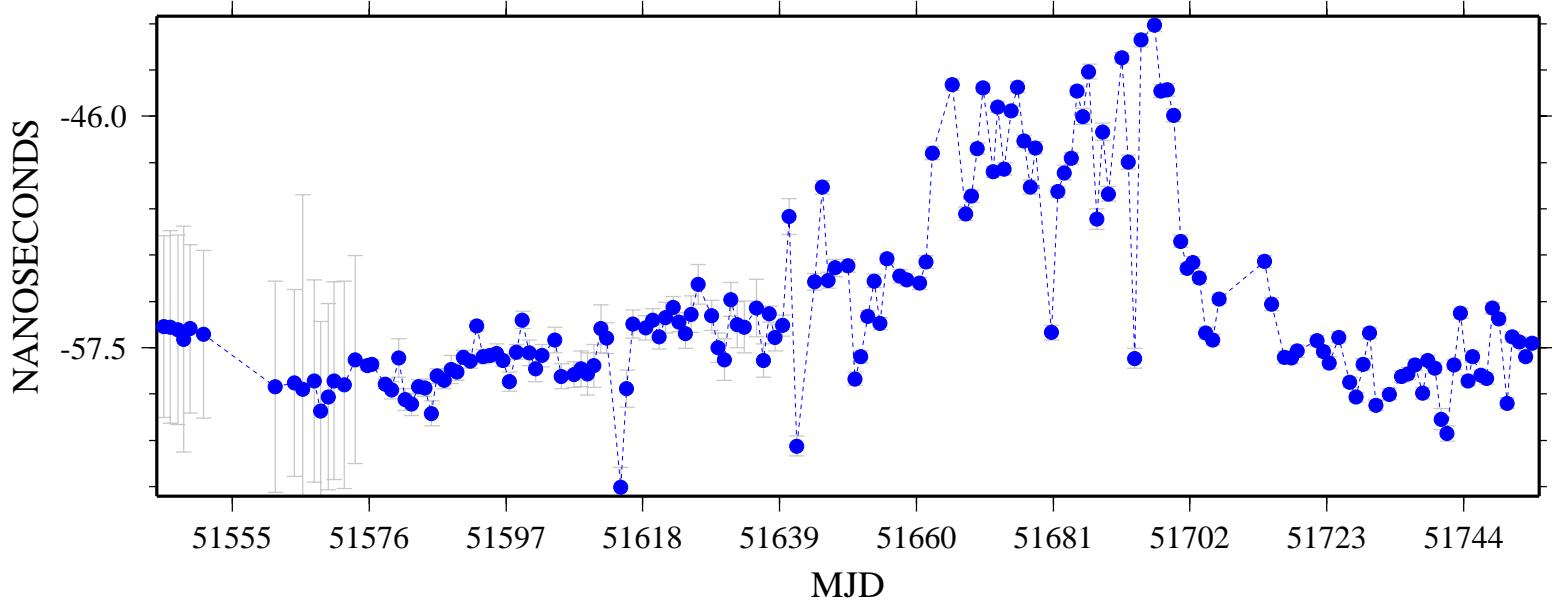
USNO(c)-AMC (TW-CV)



USNO(c)-AMC (TW-CP)



USNO(c)-AMC (CV-CP)



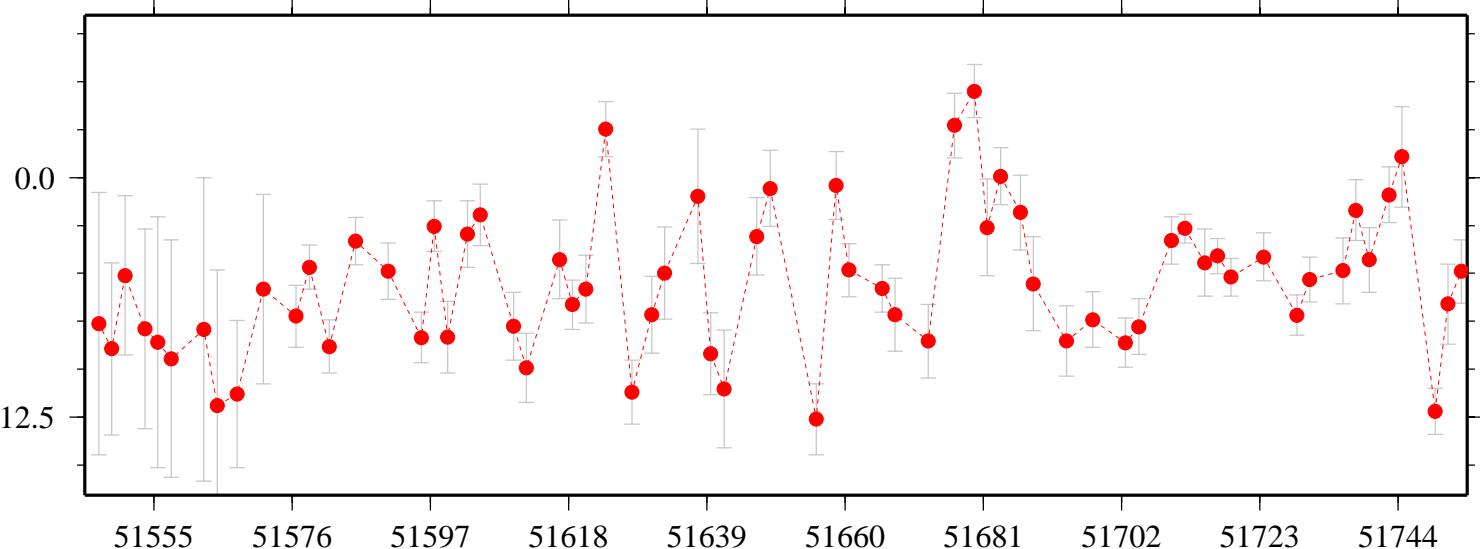
USNO(d) - NPL

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|------|---------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | 7.9 | -83.319 | | | | 91.2 | | 1.3 | 0.005 |
| 51727.5000 | | 9.3 | -83.375 | | | | 92.7 | | 1.4 | 0.007 |
| 51728.6097 | 3.8 | 11.0 | -84.034 | | -7.2 | 87.9 | 95.0 | 0.4 | 0.9 | 0.006 |
| 51729.5000 | | 15.4 | -84.317 | | | | 99.7 | | 1.2 | 0.006 |
| 51730.6098 | 5.5 | 10.8 | -84.572 | | -5.3 | 90.0 | 95.4 | 0.5 | 1.0 | 0.008 |
| 51731.5000 | | 7.3 | | | | | | | 1.1 | |
| 51732.5000 | | 8.1 | -85.569 | | | | 93.7 | | 1.0 | 0.004 |
| 51733.5000 | | 11.8 | -86.105 | | | | 97.9 | | 1.3 | 0.003 |
| 51734.5000 | | 10.7 | -86.579 | | | | 97.2 | | 1.3 | 0.003 |
| 51735.6097 | 4.7 | 9.6 | -86.531 | | -4.9 | 91.2 | 96.1 | 0.6 | 1.6 | 0.004 |
| 51736.5000 | | 9.1 | -86.711 | | | | 95.8 | | 1.5 | 0.004 |
| 51737.6097 | 4.7 | 6.4 | -86.674 | | -1.7 | 91.4 | 93.1 | 0.4 | 1.5 | 0.004 |
| 51738.5000 | | 4.9 | -86.446 | | | | 91.4 | | 1.4 | 0.003 |
| 51739.6097 | 4.3 | 8.6 | -86.883 | | -4.3 | 91.2 | 95.4 | 0.3 | 1.7 | 0.004 |
| 51740.5000 | | 9.9 | -87.240 | | | | 97.1 | | 1.5 | 0.008 |
| 51741.5000 | | 7.5 | -87.455 | | | | 94.9 | | 1.3 | 0.005 |
| 51742.6097 | 2.7 | 3.6 | -87.521 | | -0.9 | 90.2 | 91.1 | 0.3 | 1.4 | 0.006 |
| 51743.5000 | | 5.0 | -87.732 | | | | 92.7 | | 1.1 | 0.011 |
| 51744.6097 | 2.0 | 0.9 | -87.928 | | 1.1 | 89.9 | 88.8 | 0.3 | 2.6 | 0.007 |
| 51745.5000 | | | -87.787 | | | | | | | 0.008 |
| 51746.6097 | 1.5 | | -87.578 | | | 89.1 | | 0.4 | | 0.005 |
| 51747.5000 | | | -87.780 | | | | | | | 0.007 |
| 51748.5000 | | 14.3 | -88.199 | | | | 102.5 | | 1.6 | 0.004 |
| 51749.6097 | 2.5 | 14.7 | -88.447 | | -12.2 | 90.9 | 103.1 | 0.4 | 1.1 | 0.004 |
| 51750.5000 | | 6.7 | -88.376 | | | | 95.1 | | 1.6 | 0.003 |
| 51751.6097 | 2.0 | 8.6 | -88.086 | | -6.6 | 90.1 | 96.7 | 0.4 | 2.0 | 0.004 |
| 51752.5000 | | 9.6 | -87.952 | | | | 97.6 | | 1.1 | 0.005 |
| 51753.6097 | 2.9 | 7.8 | -87.498 | | -4.9 | 90.4 | 95.3 | 0.5 | 1.6 | 0.005 |
| 51754.5000 | | 5.1 | -87.177 | | | | 92.2 | | 1.5 | 0.007 |
| 51755.5000 | | 9.7 | | | | | | | 1.3 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

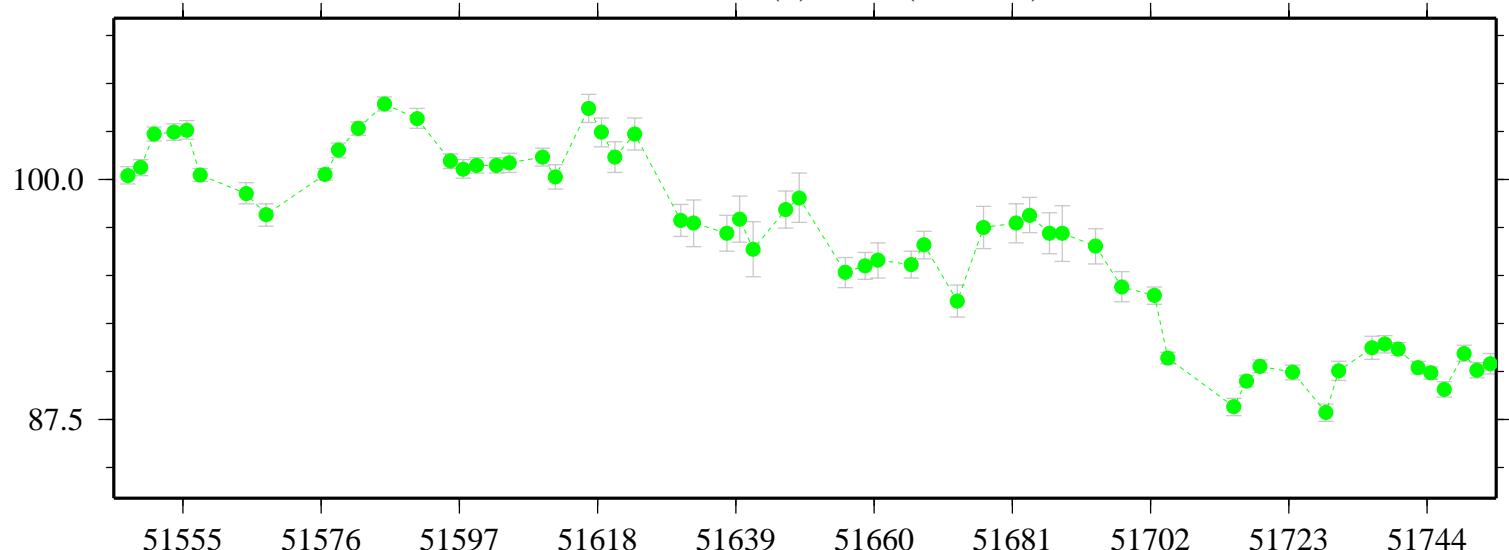
USNO(d)-NPL (TW-CV)

NANOSECONDS



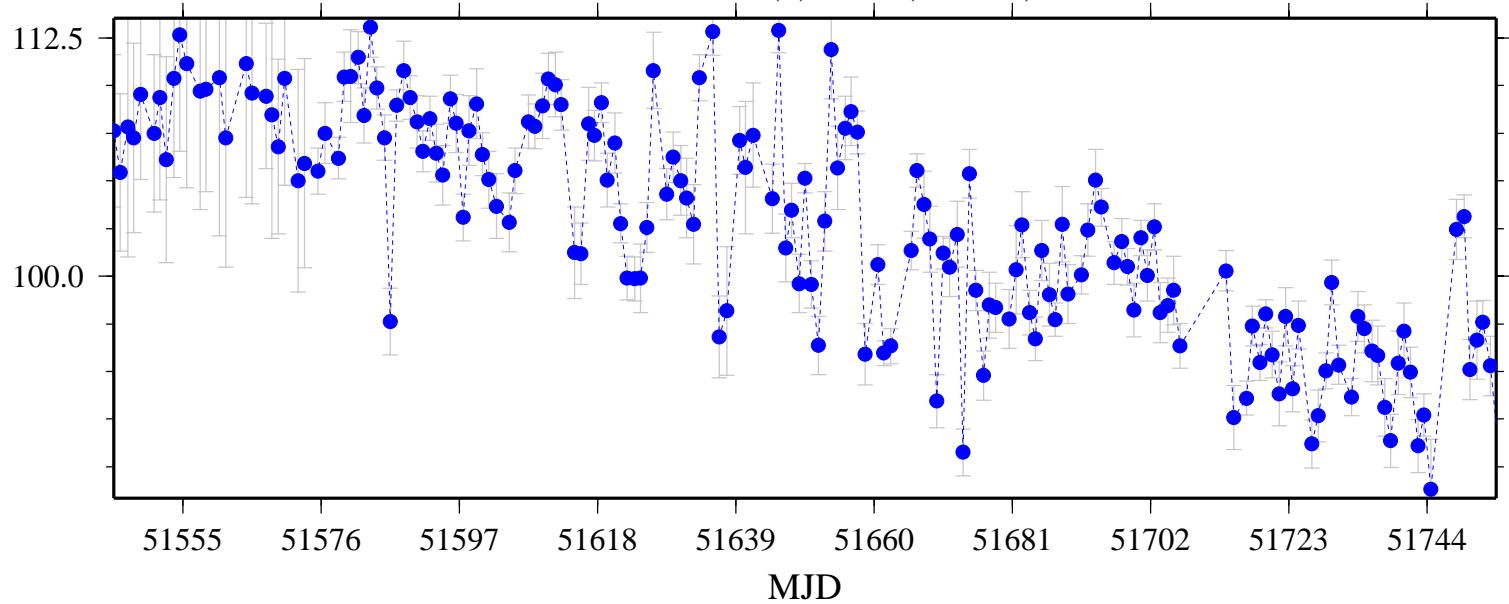
USNO(d)-NPL (TW-CP)

NANOSECONDS



USNO(d)-NPL (CV-CP)

NANOSECONDS



x and y-axes are same scale

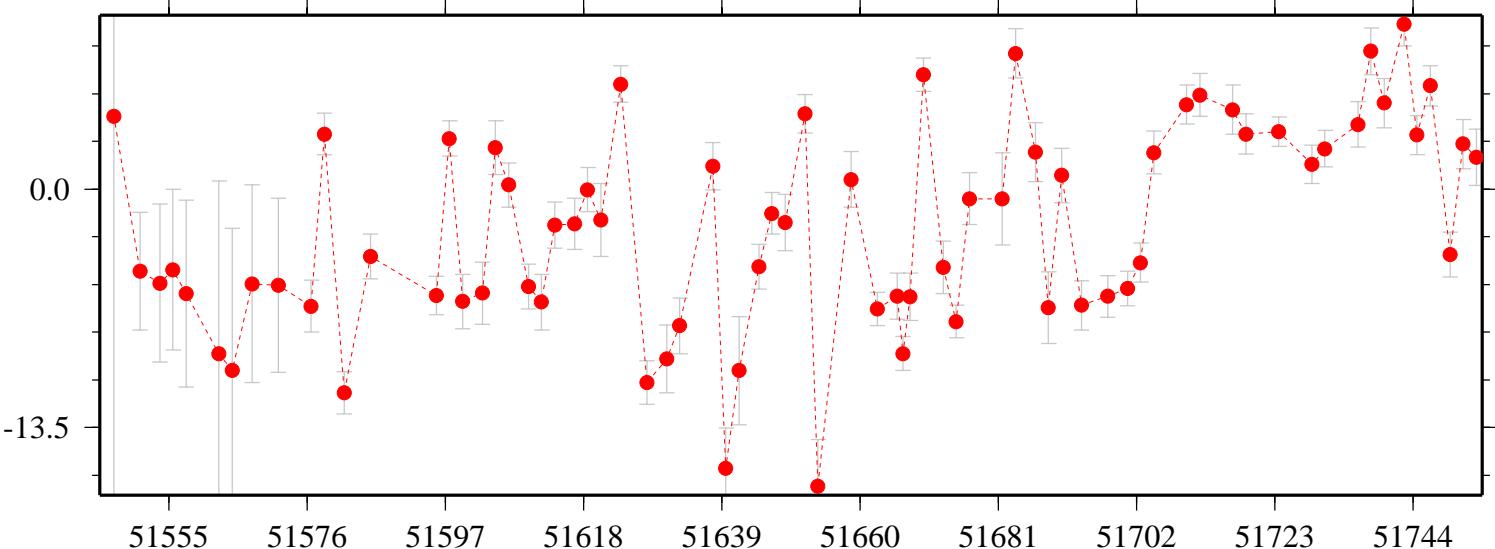
USNO(d) - PTB

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|--------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | -6.2 | | | | | | | 0.8 | |
| 51727.5000 | | -2.2 | | | | | | | 1.4 | |
| 51728.6160 | 1.3 | -0.1 | | | 1.4 | | | 0.6 | 0.9 | |
| 51729.5000 | | 3.1 | | | | | | | 1.0 | |
| 51730.6160 | 2.6 | 0.3 | 25.139 | - 5.641cp | 2.3 | -22.6 | -24.8 | 0.7 | 0.8 | 0.018 |
| 51731.5000 | | -2.8 | | | | | | | 0.9 | |
| 51732.5000 | | -3.2 | 24.097 | + 1.598cp | | | -27.3 | | 0.9 | 0.019 |
| 51733.5000 | | -0.3 | 22.997 | | | | -23.3 | | 1.1 | 0.018 |
| 51734.5000 | | -0.7 | 23.587 | | | | -24.2 | | 1.6 | 0.021 |
| 51735.6160 | -0.4 | -4.1 | 24.028 | | 3.7 | -24.5 | -28.1 | 0.6 | 1.1 | 0.024 |
| 51736.5000 | | -4.0 | 23.486 | | | | -27.5 | | 0.8 | 0.028 |
| 51737.6160 | 1.4 | -6.4 | | | 7.8 | | | 0.6 | 1.2 | |
| 51738.5000 | | -7.9 | 22.208 | + 0.733cp | | | -30.1 | | 0.8 | 0.013 |
| 51739.6160 | -0.3 | -5.2 | 21.361 | | 4.9 | -21.7 | -26.5 | 0.5 | 1.3 | 0.022 |
| 51740.5000 | | -0.9 | 22.157 | | | | -23.0 | | 1.6 | 0.035 |
| 51741.5000 | | -3.3 | 21.577 | | | | -24.8 | | 1.1 | 0.019 |
| 51742.6160 | 0.7 | -8.6 | 19.717 | | 9.3 | -19.0 | -28.4 | 0.5 | 1.1 | 0.018 |
| 51743.5000 | | -8.2 | | | | | | | 1.1 | |
| 51744.6160 | -2.8 | -5.9 | 19.040 | + 0.397cp | 3.1 | -21.9 | -25.0 | 0.6 | 0.9 | 0.011 |
| 51745.5000 | | -4.7 | 17.583 | | | | -22.3 | | 0.9 | 0.029 |
| 51746.6160 | -4.9 | -10.8 | 16.950 | | 5.9 | -21.9 | -27.7 | 0.7 | 0.9 | 0.020 |
| 51747.5000 | | -9.7 | 16.858 | | | | -26.5 | | 0.7 | 0.013 |
| 51748.5000 | | -0.7 | 16.259 | | | | -16.9 | | 1.3 | 0.020 |
| 51749.6160 | -6.5 | -2.8 | 16.192 | | -3.7 | -22.7 | -18.9 | 0.6 | 1.1 | 0.016 |
| 51750.5000 | | -10.0 | 17.193 | | | | -27.2 | | 1.3 | 0.013 |
| 51751.6160 | -6.7 | -9.2 | 16.805 | | 2.6 | -23.5 | -26.0 | 0.6 | 1.3 | 0.016 |
| 51752.5000 | | -8.5 | 17.062 | | | | -25.6 | | 1.0 | 0.013 |
| 51753.6160 | -7.4 | -9.2 | 17.787 | | 1.8 | -25.2 | -27.0 | 1.0 | 1.3 | 0.021 |
| 51754.5000 | | -11.9 | 17.529 | | | | -29.4 | | 1.2 | 0.014 |
| 51755.5000 | | -6.3 | | | | | | | 0.9 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

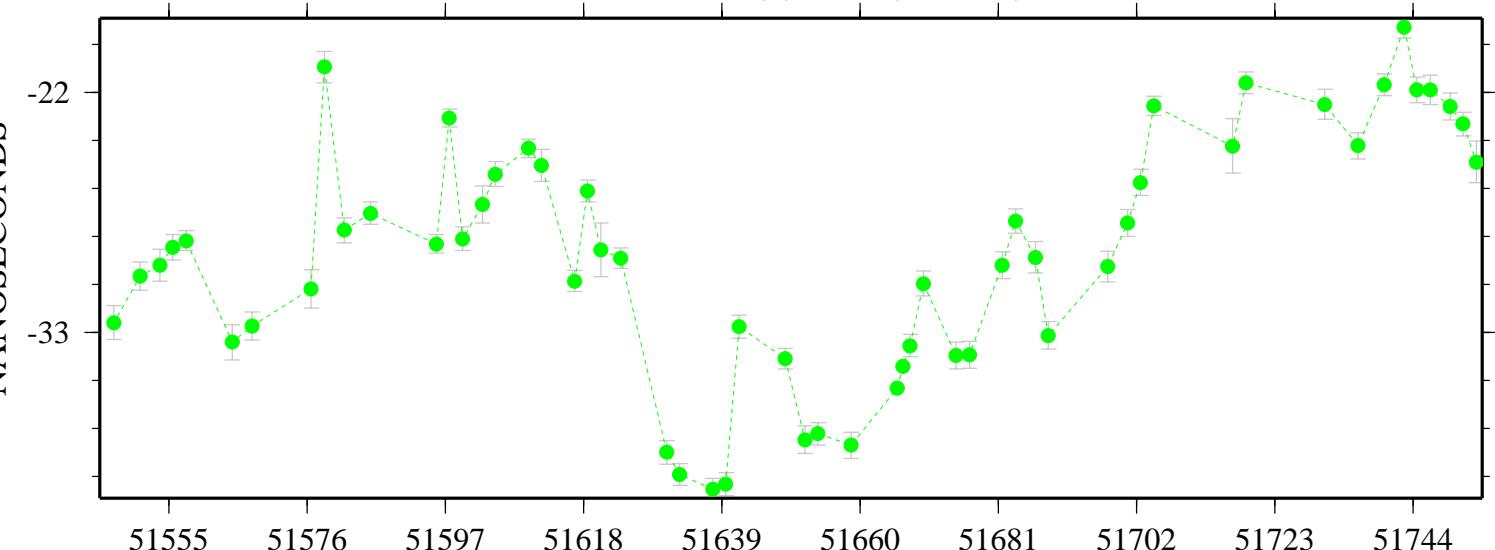
USNO(d)-PTB (TW-CV)

NANOSECONDS



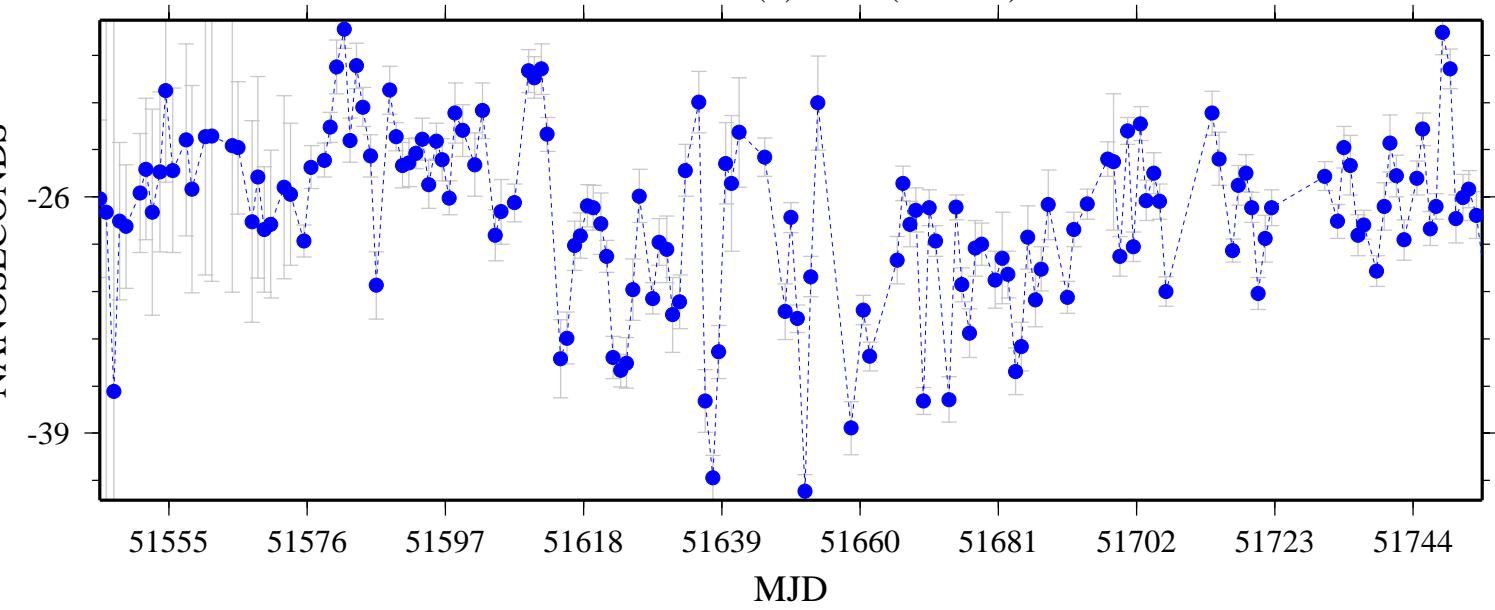
USNO(d)-PTB (TW-CP)

NANOSECONDS



USNO(d)-PTB (CV-CP)

NANOSECONDS



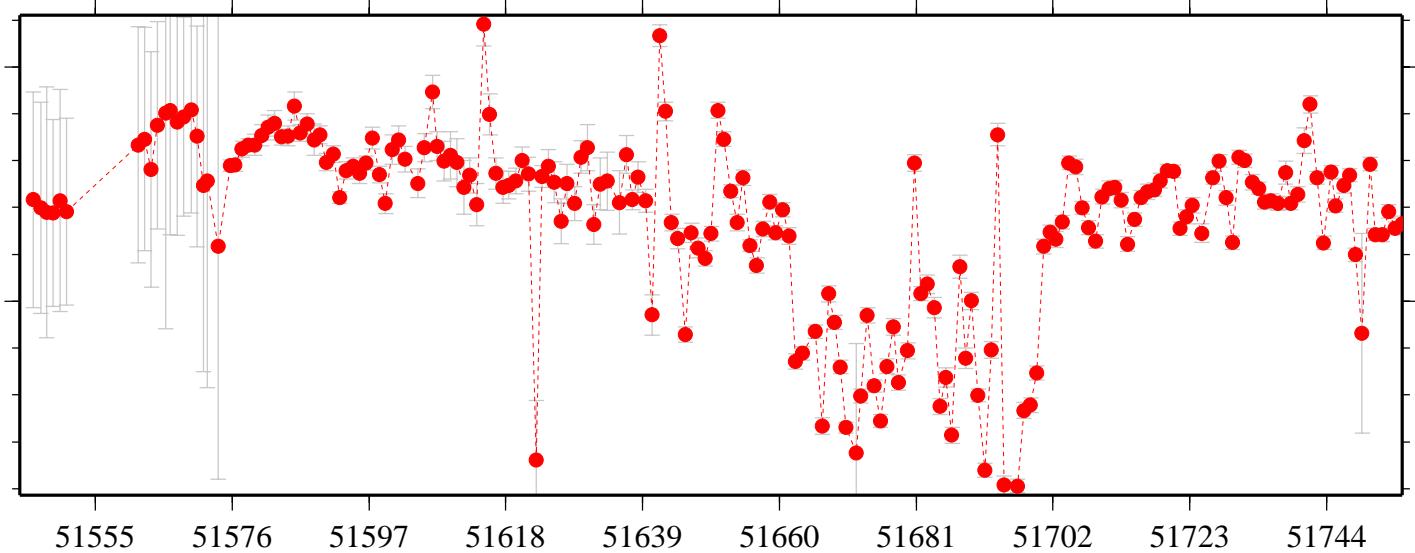
USNO(e) - AMC

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|--------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5563 | -0.4 | -58.4 | 10.207 | - 929.087cp | 58.0 | -10.6 | -68.6 | 0.1 | 0.3 | 0.004 |
| 51727.5351 | -0.4 | -59.2 | 10.170 | | 58.8 | -10.6 | -69.3 | 0.1 | 0.2 | 0.005 |
| 51728.5351 | -0.6 | -57.8 | 9.911 | | 57.1 | -10.5 | -67.7 | 0.2 | 0.3 | 0.004 |
| 51729.5782 | -1.0 | -56.1 | | | 55.1 | | | 0.1 | 0.3 | |
| 51730.5344 | -0.6 | -59.6 | 10.021 | | 59.0 | -10.6 | -69.6 | 0.2 | 0.3 | 0.004 |
| 51731.4518 | -0.8 | -59.6 | 10.146 | | 58.8 | -11.0 | -69.8 | 0.1 | 0.3 | 0.004 |
| 51732.5768 | -1.1 | -59.0 | 10.251 | | 57.8 | -11.4 | -69.2 | 0.2 | 0.3 | 0.002 |
| 51733.5972 | -0.4 | -58.0 | 3.138 | | 57.6 | -3.6 | -61.1 | 0.2 | 0.2 | Inf |
| 51734.4719 | -1.0 | -58.0 | 10.166 | + 146.835cp | 56.9 | -11.2 | -68.1 | 0.1 | 0.3 | 0.004 |
| 51735.4948 | -0.7 | -57.7 | 10.263 | - 374.730cp | 57.0 | -10.9 | -67.9 | 0.1 | 0.3 | 0.004 |
| 51736.5139 | -0.6 | -57.5 | 10.531 | | 56.9 | -11.2 | -68.0 | 0.2 | 0.3 | 0.002 |
| 51737.7024 | -0.4 | -58.7 | 10.769 | | 58.3 | -11.2 | -69.5 | 0.4 | 0.3 | 0.003 |
| 51738.4927 | 0.0 | -56.9 | 11.107 | | 56.9 | -11.1 | -68.0 | 0.1 | 0.2 | 0.003 |
| 51739.5556 | 0.3 | -57.0 | 11.296 | | 57.3 | -11.0 | -68.3 | 0.2 | 0.3 | 0.003 |
| 51740.5351 | 0.2 | -59.5 | 11.384 | | 59.7 | -11.2 | -70.9 | 0.2 | 0.5 | 0.011 |
| 51741.4926 | 0.8 | -60.6 | 10.635 | | 61.3 | -9.9 | -71.2 | 0.1 | 0.4 | 0.004 |
| 51742.5556 | 0.8 | -57.3 | 9.906 | - 480402.814cp | 58.0 | -9.1 | -67.2 | 0.2 | 0.2 | 0.036 |
| 51743.5553 | 0.1 | -55.0 | 7.689 | + 132.612cp | 55.1 | -7.6 | -62.7 | 0.1 | 0.3 | 0.016 |
| 51744.6593 | -0.1 | -58.4 | 7.173 | | 58.3 | -7.3 | -65.5 | 0.1 | 0.3 | 0.003 |
| 51745.3677 | -0.3 | -57.1 | 7.316 | | 56.8 | -7.6 | -64.4 | 0.1 | 0.3 | 0.004 |
| 51746.6171 | 0.0 | -57.7 | 7.330 | | 57.7 | -7.3 | -65.0 | 0.2 | 0.3 | 0.004 |
| 51747.5552 | 0.5 | -57.6 | 7.551 | | 58.1 | -7.0 | -65.2 | 0.1 | 0.3 | 0.002 |
| 51748.4511 | 0.7 | -53.9 | 7.724 | | 54.6 | -7.1 | -61.6 | 0.1 | 0.3 | 0.003 |
| 51749.4511 | -3.4 | -54.4 | 7.712 | | 51.1 | -11.1 | -62.1 | 4.5 | 0.3 | 0.003 |
| 51750.7011 | 0.2 | -58.5 | 7.823 | | 58.6 | -7.7 | -66.3 | 0.1 | 0.3 | 0.002 |
| 51751.4927 | 0.5 | -55.0 | 8.017 | | 55.5 | -7.5 | -63.0 | 0.1 | 0.2 | 0.003 |
| 51752.5761 | 0.4 | -55.0 | 8.149 | | 55.5 | -7.7 | -63.2 | 0.2 | 0.3 | 0.003 |
| 51753.5143 | 0.8 | -55.7 | 8.245 | | 56.5 | -7.4 | -64.0 | 0.1 | 0.3 | 0.003 |
| 51754.4927 | 0.9 | -54.9 | 8.490 | | 55.8 | -7.6 | -63.4 | 0.1 | 0.3 | 0.004 |
| 51755.5556 | 0.7 | -55.3 | | | 56.0 | | | 0.2 | 0.3 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

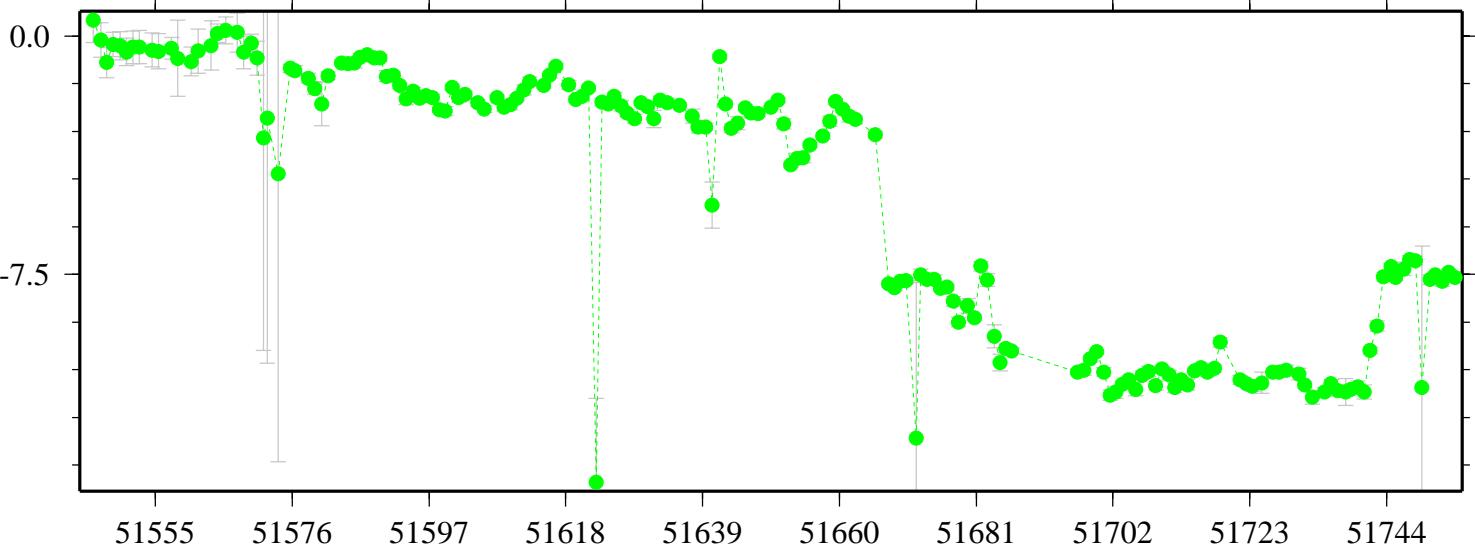
USNO(e)-AMC (TW-CV)

NANOSECONDS



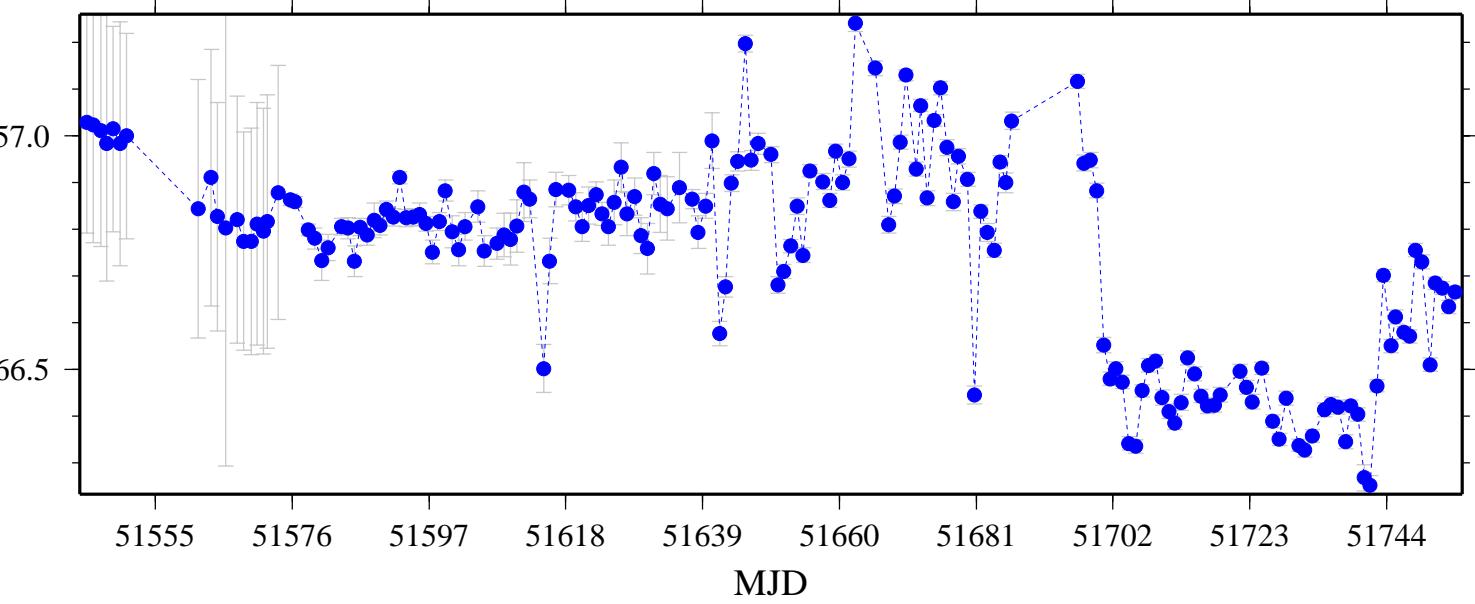
USNO(e)-AMC (TW-CP)

NANOSECONDS



USNO(e)-AMC (CV-CP)

NANOSECONDS



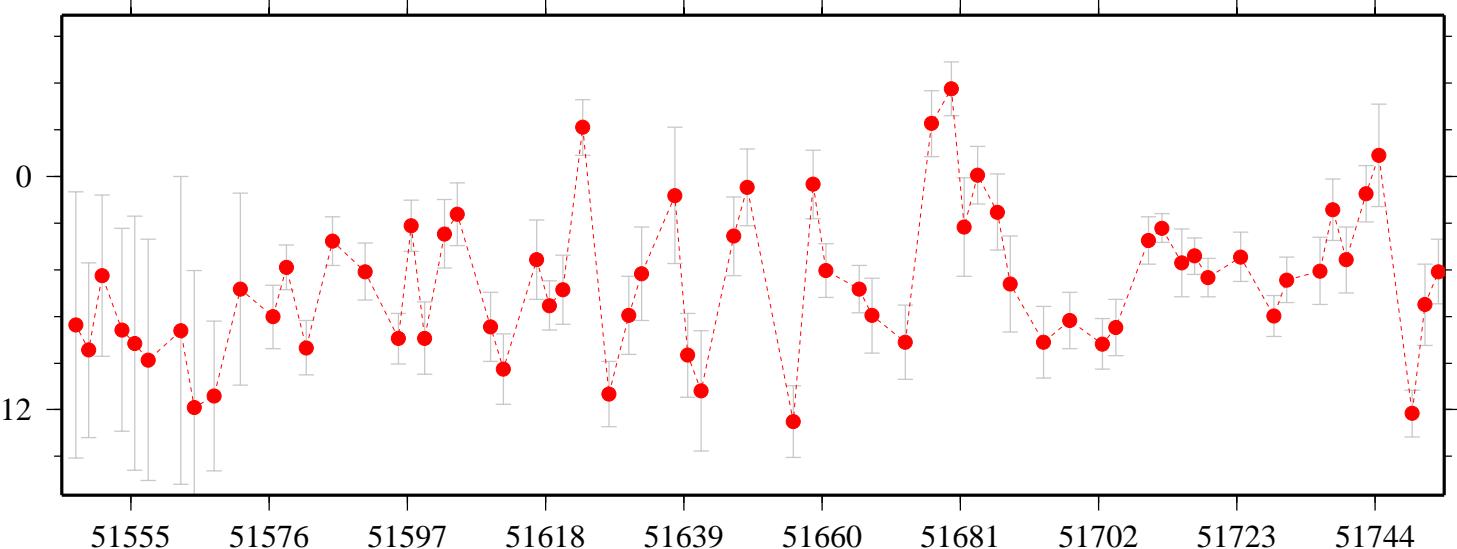
USNO(f) - NPL

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|------|---------|---------------------|---------------------------------|-------|-------|--|-----|-------|
| | MJD | TW | CV | CP | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | | 7.9 | -85.394 | | | | 93.3 | | 1.3 |
| 51727.5000 | | | 9.3 | -85.482 | | | | 94.8 | | 1.4 |
| 51728.6097 | 3.8 | 11.0 | -86.058 | | | -7.2 | 89.9 | 97.1 | 0.4 | 0.9 |
| 51729.5000 | | | 15.4 | | | | | | | 1.2 |
| 51730.6098 | 5.5 | 10.8 | -86.705 | | | -5.3 | 92.2 | 97.5 | 0.5 | 1.0 |
| 51731.5000 | | | 7.3 | -87.046 | | | | 94.3 | | 1.1 |
| 51732.5000 | | | 8.1 | -87.560 | | | | 95.6 | | 1.0 |
| 51733.5000 | | | 11.8 | -88.045 | | | | 99.8 | | 1.3 |
| 51734.5000 | | | 10.7 | -88.514 | | | | 99.2 | | 1.3 |
| 51735.6097 | 4.7 | 9.6 | -88.655 | | | -4.9 | 93.4 | 98.2 | 0.6 | 1.6 |
| 51736.5000 | | | 9.1 | -88.796 | | | | 97.9 | | 1.5 |
| 51737.6097 | 4.7 | 6.4 | -88.838 | | | -1.7 | 93.6 | 95.3 | 0.4 | 1.5 |
| 51738.5000 | | | 4.9 | -88.836 | | | | 93.7 | | 1.4 |
| 51739.6097 | 4.3 | 8.6 | -89.020 | | | -4.3 | 93.3 | 97.6 | 0.3 | 1.7 |
| 51740.5000 | | | 9.9 | -89.198 | | | | 99.1 | | 1.5 |
| 51741.5000 | | | 7.5 | -89.732 | | | | 97.2 | | 1.3 |
| 51742.6097 | 2.7 | 3.6 | -90.583 | - 480402.690cp | | -0.9 | 93.3 | 94.2 | 0.3 | 1.4 |
| 51743.5000 | | | 5.0 | -92.299 | + 132.678cp | | | 97.3 | | 1.1 |
| 51744.6097 | 2.0 | 0.9 | -92.882 | | | 1.1 | 94.9 | 93.8 | 0.3 | 2.6 |
| 51745.5000 | | | | -92.857 | | | | | | 0.007 |
| 51746.6097 | 1.5 | | -93.012 | | | | 94.5 | | 0.4 | |
| 51747.5000 | | | -93.223 | | | | | | | 0.011 |
| 51748.5000 | | | 14.3 | -93.541 | | | | 107.8 | | 1.6 |
| 51749.6097 | 2.5 | 14.7 | -93.530 | | | -12.2 | 96.0 | 108.2 | 0.4 | 1.1 |
| 51750.5000 | | | 6.7 | -93.397 | | | | 100.1 | | 1.6 |
| 51751.6097 | 2.0 | 8.6 | -93.162 | | | -6.6 | 95.1 | 101.7 | 0.4 | 2.0 |
| 51752.5000 | | | 9.6 | -92.863 | | | | 102.5 | | 1.1 |
| 51753.6097 | 2.9 | 7.8 | -92.393 | | | -4.9 | 95.3 | 100.2 | 0.5 | 1.6 |
| 51754.5000 | | | 5.1 | -92.099 | | | | 97.2 | | 1.5 |
| 51755.5000 | | | 9.7 | | | | | | | 1.3 |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

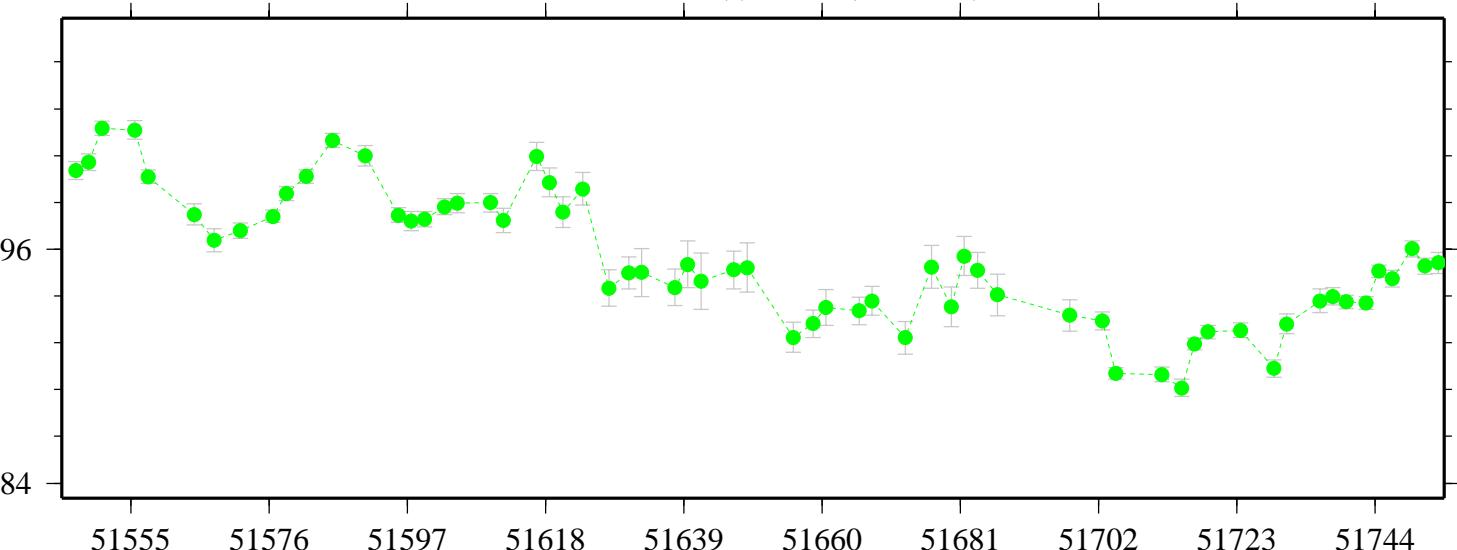
USNO(f)-NPL (TW-CV)

NANOSECONDS



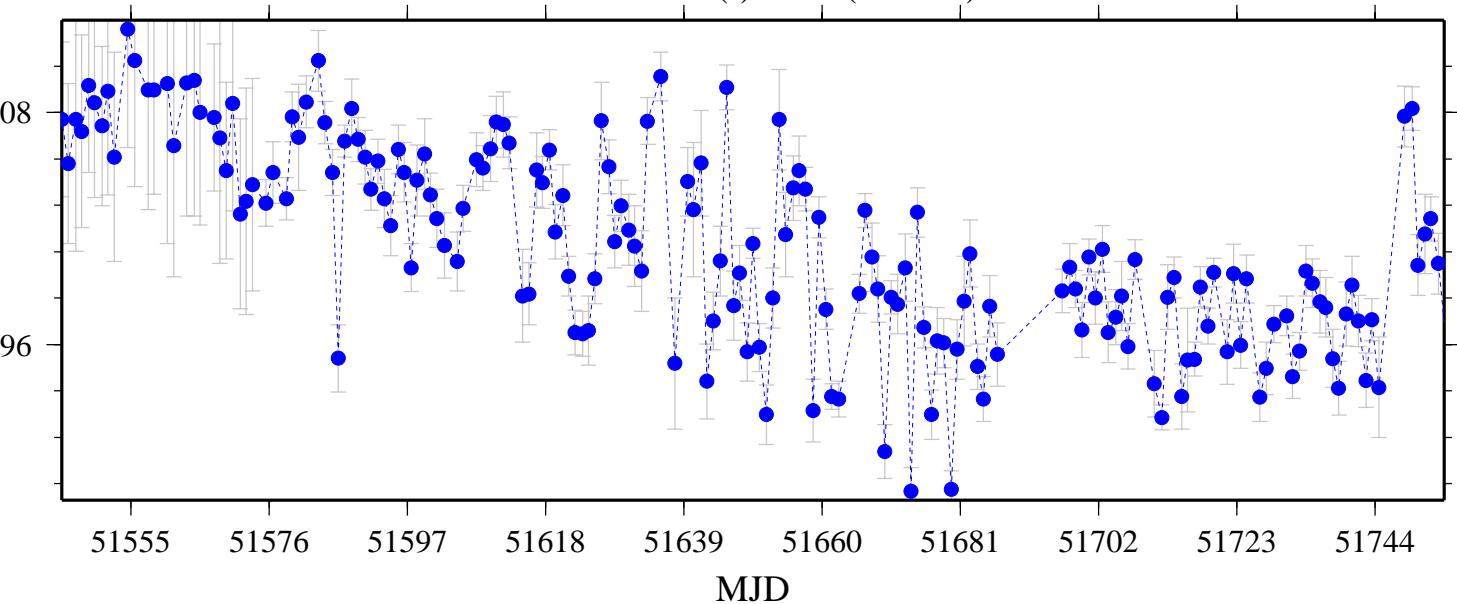
USNO(f)-NPL (TW-CP)

NANOSECONDS



USNO(f)-NPL (CV-CP)

NANOSECONDS



x and y-axes are same scale

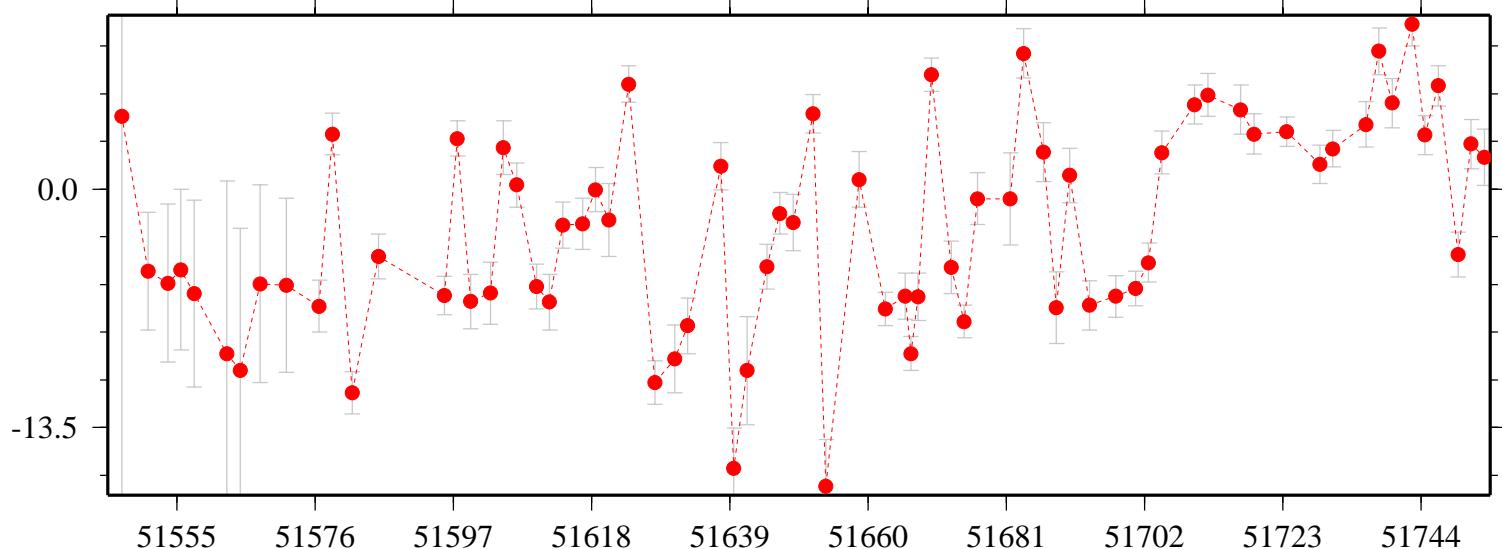
USNO(f) - PTB

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|--------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | -6.2 | | | | | | | 0.8 | |
| 51727.5000 | | -2.2 | | | | | | | 1.4 | |
| 51728.6160 | 1.3 | -0.1 | | | 1.4 | | | 0.6 | 0.9 | |
| 51729.5000 | | 3.1 | | | | | | | 1.0 | |
| 51730.6160 | 2.6 | 0.3 | 22.783 | - 6.693CP | 2.3 | -20.2 | -22.5 | 0.7 | 0.8 | 0.018 |
| 51731.5000 | | -2.8 | 21.837 | | | | -24.7 | | 0.9 | 0.019 |
| 51732.5000 | | -3.2 | 20.832 | | | | -24.1 | | 0.9 | 0.018 |
| 51733.5000 | | -0.3 | 19.406 | | | | -19.7 | | 1.1 | 0.020 |
| 51734.5000 | | -0.7 | 19.905 | | | | -20.6 | | 1.6 | 0.021 |
| 51735.6160 | -0.4 | -4.1 | 20.235 | | 3.7 | -20.7 | -24.3 | 0.6 | 1.1 | 0.023 |
| 51736.5000 | | -4.0 | 19.926 | | | | -24.0 | | 0.8 | 0.028 |
| 51737.6160 | 1.4 | -6.4 | | | 7.8 | | | 0.6 | 1.2 | |
| 51738.5000 | | -7.9 | 16.802 | | | | -24.7 | | 0.8 | 0.013 |
| 51739.6160 | -0.3 | -5.2 | 16.592 | | 4.9 | -16.9 | -21.8 | 0.5 | 1.3 | 0.023 |
| 51740.5000 | | -0.9 | 17.846 | | | | -18.7 | | 1.6 | 0.036 |
| 51741.5000 | | -3.3 | 17.079 | | | | -20.3 | | 1.1 | 0.018 |
| 51742.6160 | 0.7 | -8.6 | 14.290 | - 480403.124CP | 9.3 | -13.6 | -22.9 | 0.5 | 1.1 | 0.030 |
| 51743.5000 | | -8.2 | | | | | | | 1.1 | |
| 51744.6160 | -2.8 | -5.9 | 11.857 | + 133.524CP | 3.1 | -14.7 | -17.8 | 0.6 | 0.9 | 0.010 |
| 51745.5000 | | -4.7 | 10.671 | | | | -15.4 | | 0.9 | 0.029 |
| 51746.6160 | -4.9 | -10.8 | 9.959 | | 5.9 | -14.9 | -20.8 | 0.7 | 0.9 | 0.020 |
| 51747.5000 | | -9.7 | 9.728 | | | | -19.4 | | 0.7 | 0.013 |
| 51748.5000 | | -0.7 | 9.423 | | | | -10.1 | | 1.3 | 0.020 |
| 51749.6160 | -6.5 | -2.8 | 8.842 | | -3.7 | -15.3 | -11.6 | 0.6 | 1.1 | 0.016 |
| 51750.5000 | | -10.0 | 9.294 | | | | -19.3 | | 1.3 | 0.013 |
| 51751.6160 | -6.7 | -9.2 | 8.403 | | 2.6 | -15.1 | -17.6 | 0.6 | 1.3 | 0.016 |
| 51752.5000 | | -8.5 | 8.547 | | | | -17.1 | | 1.0 | 0.012 |
| 51753.6160 | -7.4 | -9.2 | 9.180 | | 1.8 | -16.6 | -18.4 | 1.0 | 1.3 | 0.021 |
| 51754.5000 | | -11.9 | 8.940 | | | | -20.8 | | 1.2 | 0.014 |
| 51755.5000 | | -6.3 | | | | | | | 0.9 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

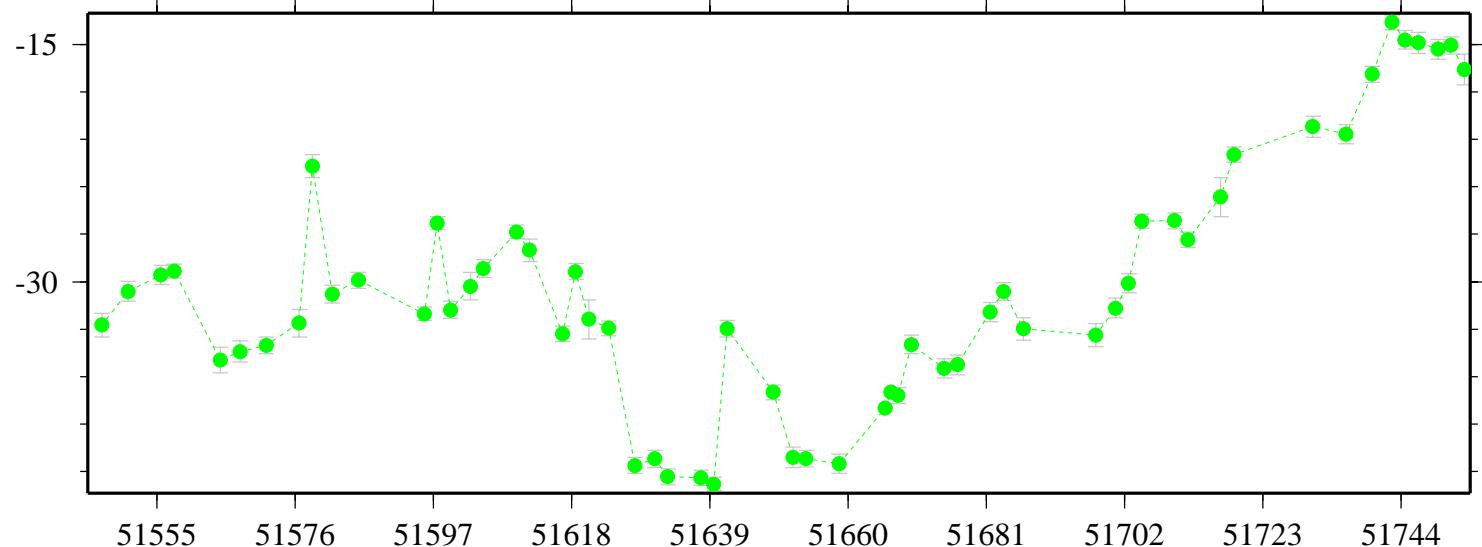
USNO(f)-PTB (TW-CV)

NANOSECONDS



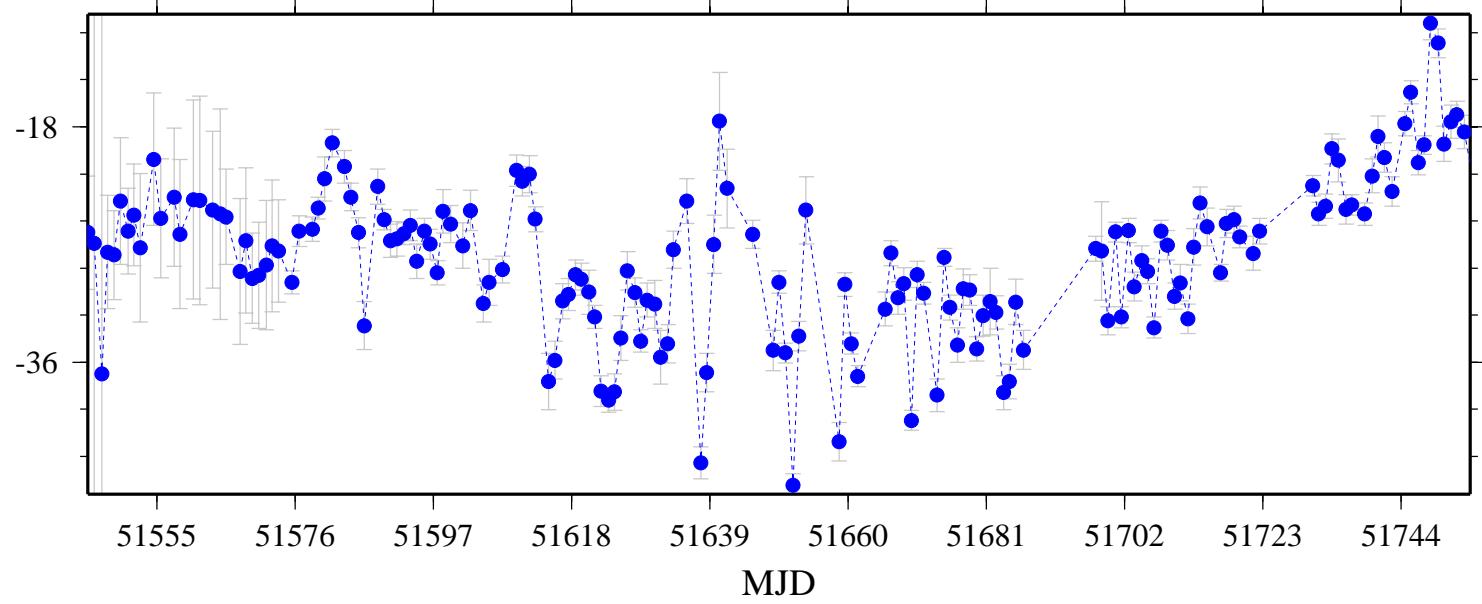
USNO(f)-PTB (TW-CP)

NANOSECONDS



USNO(f)-PTB (CV-CP)

NANOSECONDS



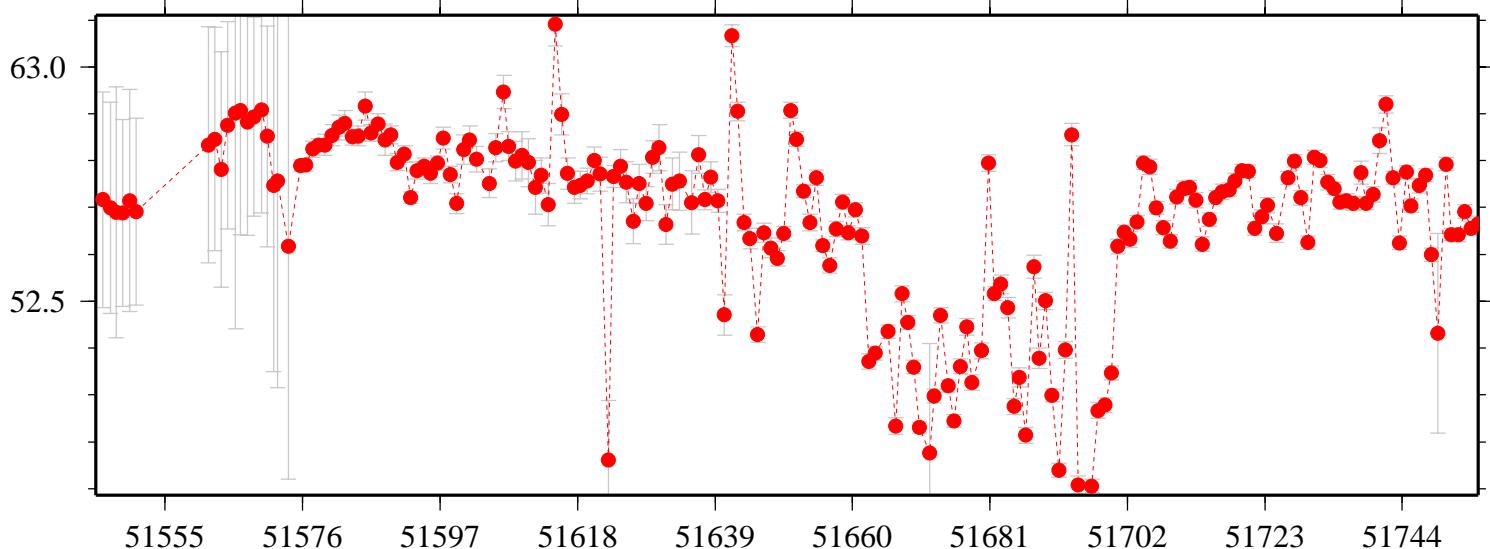
USNO(g) - AMC

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|---------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5563 | -0.4 | -58.4 | -1.224 | - 929.437cp | 58.0 | 0.9 | -57.2 | 0.1 | 0.3 | 0.004 |
| 51727.5351 | -0.4 | -59.2 | -1.237 | | 58.8 | 0.8 | -57.9 | 0.1 | 0.2 | 0.006 |
| 51728.5351 | -0.6 | -57.8 | -1.502 | | 57.1 | 0.9 | -56.3 | 0.2 | 0.3 | 0.005 |
| 51729.5782 | -1.0 | -56.1 | -1.512 | | 55.1 | 0.5 | -54.6 | 0.1 | 0.3 | 0.005 |
| 51730.5344 | -0.6 | -59.6 | -1.375 | | 59.0 | 0.8 | -58.2 | 0.2 | 0.3 | 0.005 |
| 51731.4518 | -0.8 | -59.6 | -1.239 | | 58.8 | 0.4 | -58.4 | 0.1 | 0.3 | 0.005 |
| 51732.5768 | -1.1 | -59.0 | -1.093 | | 57.8 | 0.0 | -57.9 | 0.2 | 0.3 | 0.003 |
| 51733.5972 | -0.4 | -58.0 | -8.042 | | 57.6 | 7.6 | -49.9 | 0.2 | 0.2 | Inf |
| 51734.4719 | -1.0 | -58.0 | -1.526 | + 146.556cp | 56.9 | 0.5 | -56.4 | 0.1 | 0.3 | 0.005 |
| 51735.4948 | -0.7 | -57.7 | -1.471 | - 374.701cp | 57.0 | 0.8 | -56.2 | 0.1 | 0.3 | 0.004 |
| 51736.5139 | -0.6 | -57.5 | -1.176 | | 56.9 | 0.6 | -56.3 | 0.2 | 0.3 | 0.003 |
| 51737.7024 | -0.4 | -58.7 | -0.933 | | 58.3 | 0.5 | -57.7 | 0.4 | 0.3 | 0.004 |
| 51738.4927 | 0.0 | -56.9 | -0.392 | | 56.9 | 0.4 | -56.5 | 0.1 | 0.2 | 0.004 |
| 51739.5556 | 0.3 | -57.0 | -0.069 | | 57.3 | 0.3 | -57.0 | 0.2 | 0.3 | 0.003 |
| 51740.5351 | 0.2 | -59.5 | 0.026 | | 59.7 | 0.2 | -59.5 | 0.2 | 0.5 | 0.010 |
| 51741.4926 | 0.8 | -60.6 | -0.701 | | 61.3 | 1.5 | -59.9 | 0.1 | 0.4 | 0.005 |
| 51742.5556 | 0.8 | -57.3 | -3.935 | - 196793.875cp | 58.0 | 4.7 | -53.3 | 0.2 | 0.2 | 0.176 |
| 51743.5553 | 0.1 | -55.0 | -14.132 | + 130.037cp | 55.1 | 14.3 | -40.9 | 0.1 | 0.3 | 0.060 |
| 51744.6593 | -0.1 | -58.4 | -15.976 | | 58.3 | 15.9 | -42.4 | 0.1 | 0.3 | 0.003 |
| 51745.3677 | -0.3 | -57.1 | -15.776 | | 56.8 | 15.5 | -41.3 | 0.1 | 0.3 | 0.005 |
| 51746.6171 | 0.0 | -57.7 | -15.419 | | 57.7 | 15.4 | -42.3 | 0.2 | 0.3 | 0.004 |
| 51747.5552 | 0.5 | -57.6 | -15.169 | | 58.1 | 15.7 | -42.4 | 0.1 | 0.3 | 0.003 |
| 51748.4511 | 0.7 | -53.9 | -14.863 | | 54.6 | 15.5 | -39.1 | 0.1 | 0.3 | 0.004 |
| 51749.4511 | -3.4 | -54.4 | -14.862 | | 51.1 | 11.5 | -39.6 | 4.5 | 0.3 | 0.003 |
| 51750.7011 | 0.2 | -58.5 | -14.875 | | 58.6 | 15.0 | -43.6 | 0.1 | 0.3 | 0.003 |
| 51751.4927 | 0.5 | -55.0 | -14.672 | | 55.5 | 15.2 | -40.3 | 0.1 | 0.2 | 0.003 |
| 51752.5761 | 0.4 | -55.0 | -14.571 | | 55.5 | 15.0 | -40.5 | 0.2 | 0.3 | 0.003 |
| 51753.5143 | 0.8 | -55.7 | -14.511 | | 56.5 | 15.3 | -41.2 | 0.1 | 0.3 | 0.004 |
| 51754.4927 | 0.9 | -54.9 | -14.223 | | 55.8 | 15.1 | -40.6 | 0.1 | 0.3 | 0.006 |
| 51755.5556 | 0.7 | -55.3 | | | 56.0 | | | 0.2 | 0.3 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

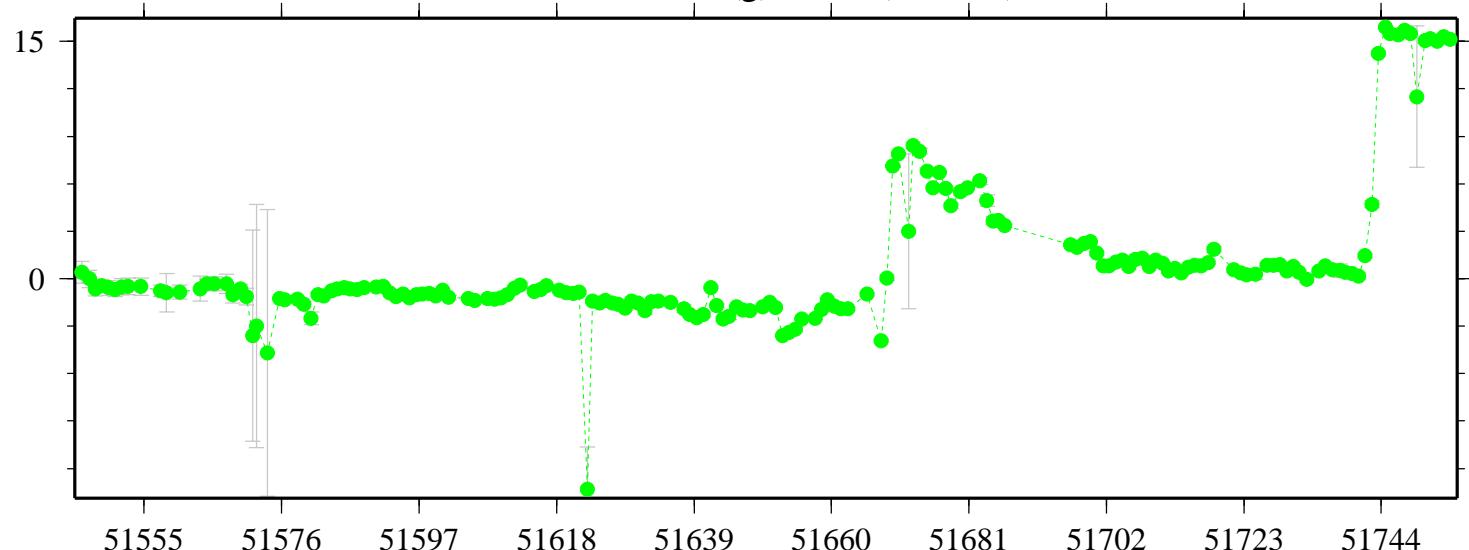
USNO(g)-AMC (TW-CV)

NANOSECONDS



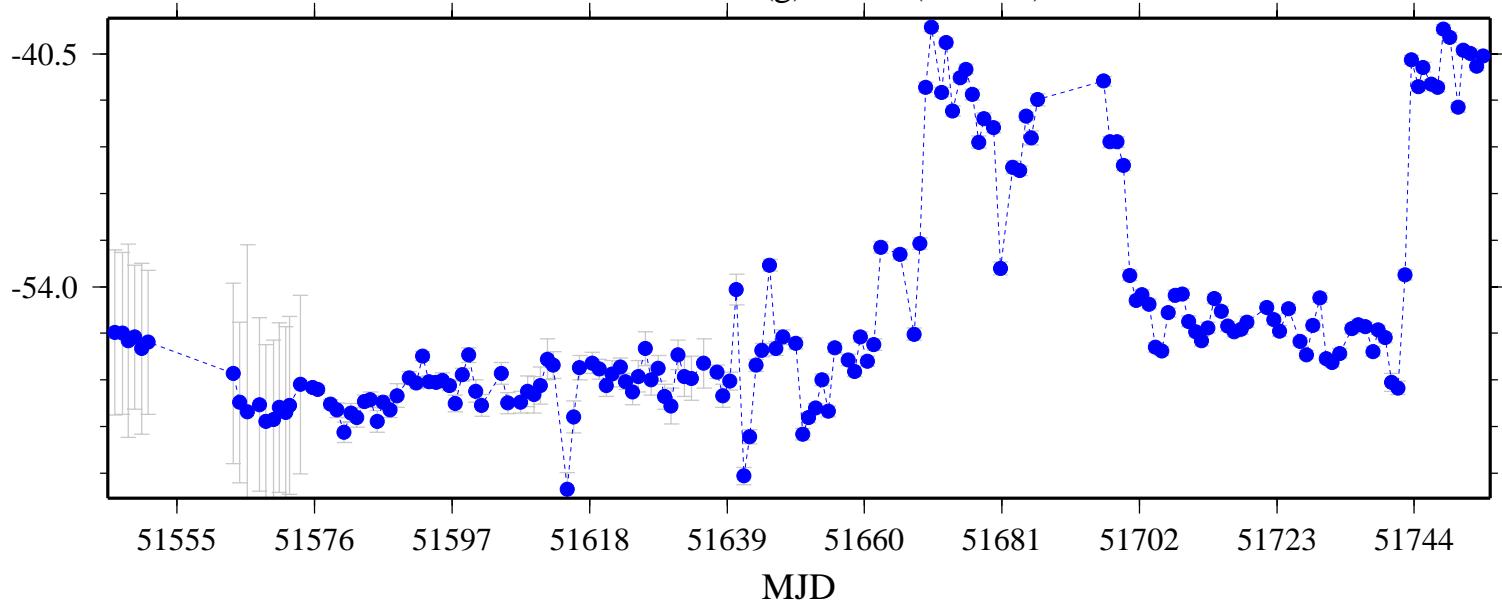
USNO(g)-AMC (TW-CP)

NANOSECONDS



USNO(g)-AMC (CV-CP)

NANOSECONDS



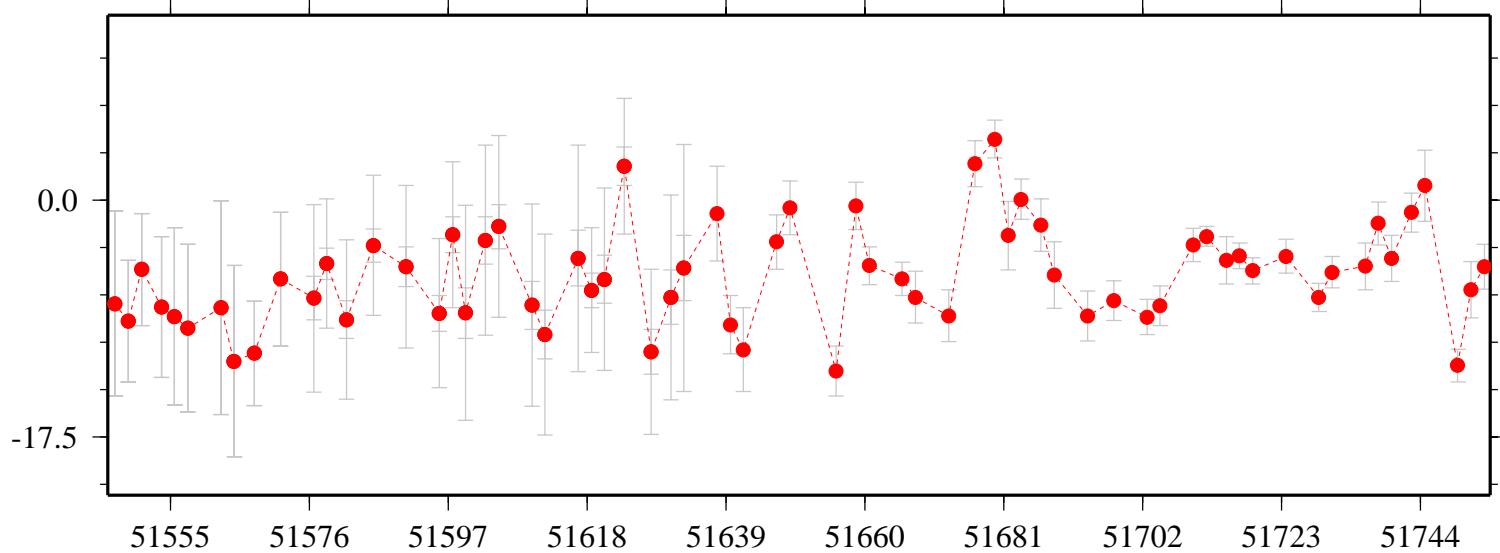
USNO(h) – NPL

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|------|----------|------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | 7.9 | -93.136 | | | | 101.0 | | 1.3 | 0.006 |
| 51727.5000 | | 9.3 | -93.204 | | | | 102.5 | | 1.4 | 0.009 |
| 51728.6097 | 3.8 | 11.0 | -93.785 | | -7.2 | 97.6 | 104.8 | 0.4 | 0.9 | 0.007 |
| 51729.5000 | | 15.4 | -94.068 | | | | 109.4 | | 1.2 | 0.007 |
| 51730.6098 | 5.5 | 10.8 | -94.416 | | -5.3 | 99.9 | 105.2 | 0.5 | 1.0 | 0.009 |
| 51731.5000 | | 7.3 | -94.752 | | | | 102.1 | | 1.1 | 0.008 |
| 51732.5000 | | 8.1 | -95.219 | | | | 103.3 | | 1.0 | 0.006 |
| 51733.5000 | | 11.8 | -95.718 | | | | 107.5 | | 1.3 | 0.004 |
| 51734.5000 | | 10.7 | -96.242 | | | | 106.9 | | 1.3 | 0.005 |
| 51735.6097 | 4.7 | 9.6 | -96.433 | | -4.9 | 101.1 | 106.0 | 0.6 | 1.6 | 0.004 |
| 51736.5000 | | 9.1 | -96.569 | | | | 105.7 | | 1.5 | 0.004 |
| 51737.6097 | 4.7 | 6.4 | -96.595 | | -1.7 | 101.3 | 103.0 | 0.4 | 1.5 | 0.006 |
| 51738.5000 | | 4.9 | -96.398 | | | | 101.3 | | 1.4 | 0.005 |
| 51739.6097 | 4.3 | 8.6 | -96.453 | | -4.3 | 100.7 | 105.0 | 0.3 | 1.7 | 0.005 |
| 51740.5000 | | 9.9 | -96.625 | | | | 106.5 | | 1.5 | 0.007 |
| 51741.5000 | | 7.5 | -97.134 | | | | 104.6 | | 1.3 | 0.006 |
| 51742.6097 | 2.7 | 3.6 | -101.013 | - 196793.818CP | -0.9 | 103.7 | 104.6 | 0.3 | 1.4 | 0.177 |
| 51743.5000 | | 5.0 | -110.066 | + 130.063CP | | | 115.1 | | 1.1 | 0.066 |
| 51744.6097 | 2.0 | 0.9 | -112.205 | | 1.1 | 114.2 | 113.1 | 0.3 | 2.6 | 0.008 |
| 51745.5000 | | | -112.114 | | | | | | | 0.009 |
| 51746.6097 | 1.5 | | -111.961 | | | 113.4 | | 0.4 | | 0.007 |
| 51747.5000 | | | -112.119 | | | | | | | 0.011 |
| 51748.5000 | | 14.3 | -112.297 | | | | 126.6 | | 1.6 | 0.005 |
| 51749.6097 | 2.5 | 14.7 | -112.284 | | -12.2 | 114.8 | 127.0 | 0.4 | 1.1 | 0.003 |
| 51750.5000 | | 6.7 | -112.236 | | | | 119.0 | | 1.6 | 0.004 |
| 51751.6097 | 2.0 | 8.6 | -112.023 | | -6.6 | 114.0 | 120.6 | 0.4 | 2.0 | 0.004 |
| 51752.5000 | | 9.6 | -111.748 | | | | 121.4 | | 1.1 | 0.005 |
| 51753.6097 | 2.9 | 7.8 | -111.332 | | -4.9 | 114.2 | 119.1 | 0.5 | 1.6 | 0.007 |
| 51754.5000 | | 5.1 | -110.984 | | | | 116.0 | | 1.5 | 0.010 |
| 51755.5000 | | 9.7 | | | | | | | 1.3 | |

The **ADJUSTMENTS** column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

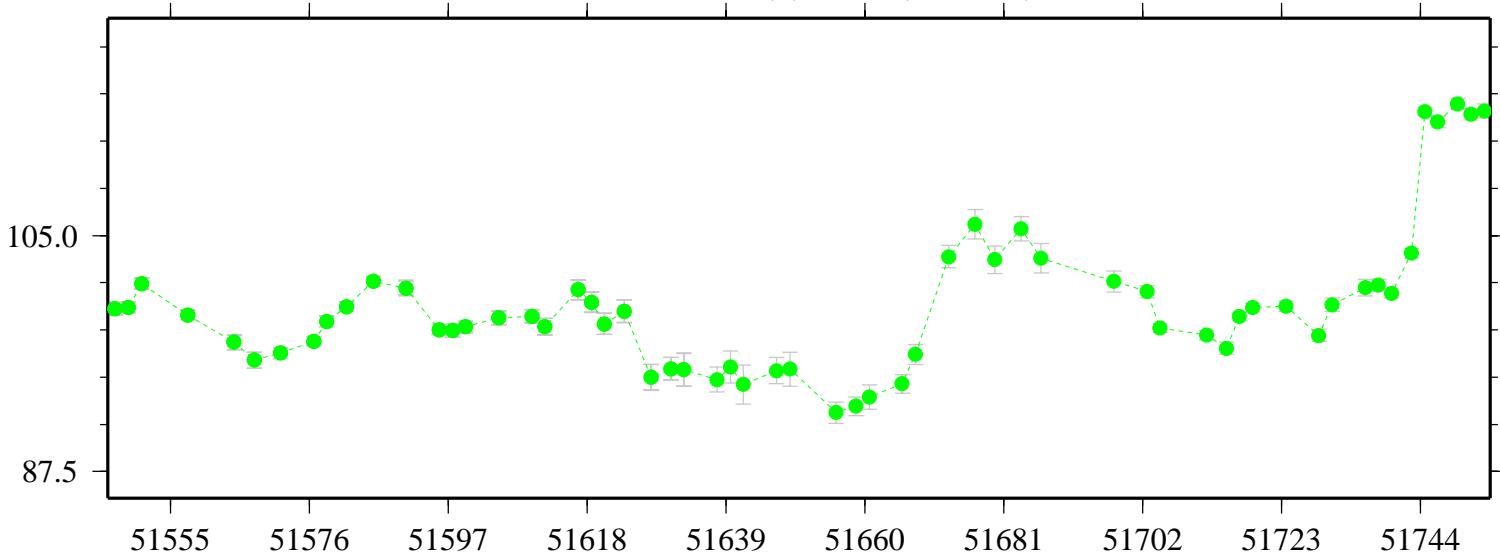
USNO(h)-NPL (TW-CV)

NANOSECONDS



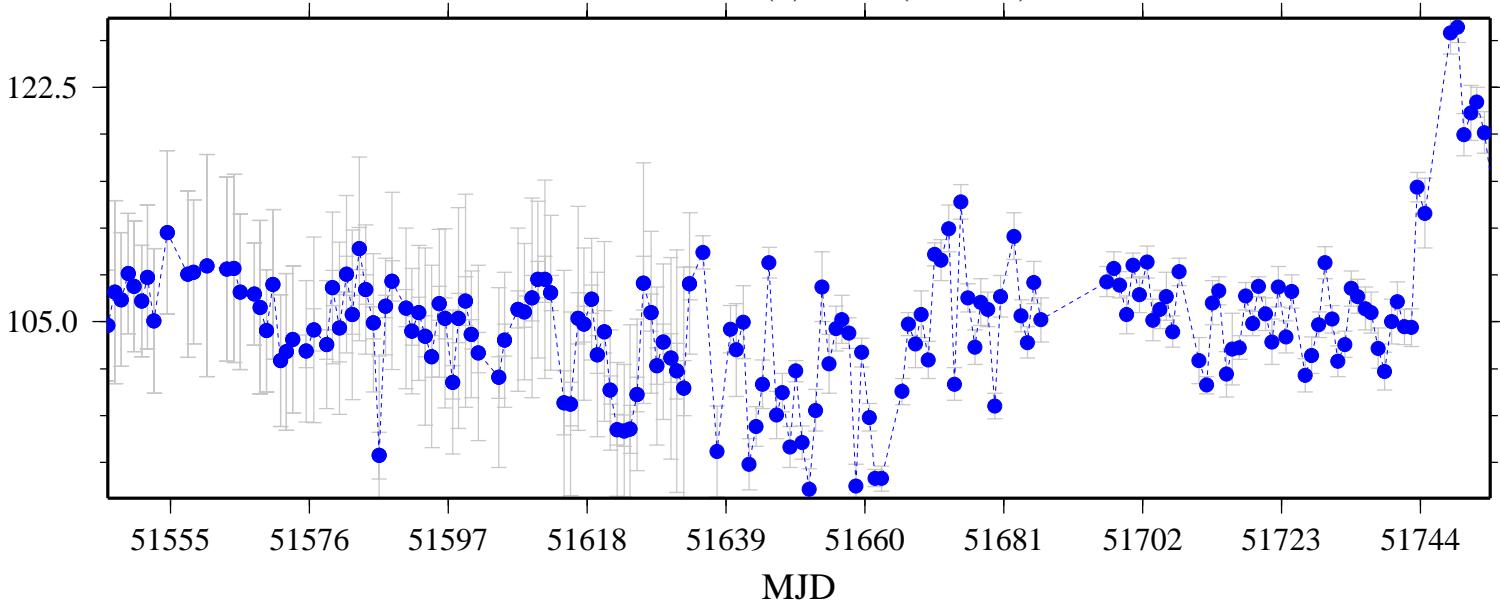
USNO(h)-NPL (TW-CP)

NANOSECONDS



USNO(h)-NPL (CV-CP)

NANOSECONDS



x and y-axes are same scale

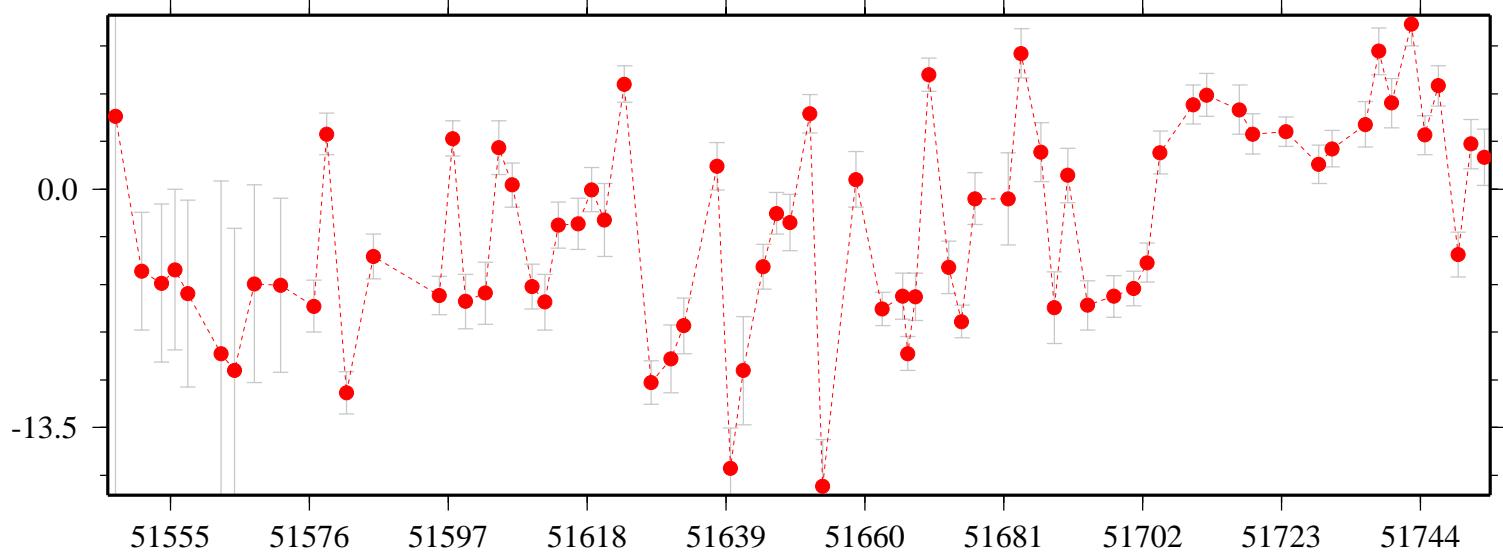
USNO(h) - PTB

| | TIME TRANS. 1-DAY AVE. (ns) | | | ADJUSTMENTS (ns) | TIME TRANS. DIFFERENCES (ns) | | | RMS SCATTER OF DAILY LINEAR FIT (ns) | | |
|------------|-----------------------------|-------|---------|----------------------------|------------------------------|-------|-------|--------------------------------------|-----|-------|
| MJD | TW | CV | CP | | TW-CV | TW-CP | CV-CP | TW | CV | CP |
| 51726.5000 | | -6.2 | | | | | | | 0.8 | |
| 51727.5000 | | -2.2 | | | | | | | 1.4 | |
| 51728.6160 | 1.3 | -0.1 | | | 1.4 | | | 0.6 | 0.9 | |
| 51729.5000 | | 3.1 | | | | | | | 1.0 | |
| 51730.6160 | 2.6 | 0.3 | 9.075 | - 9.679 _{CP} | 2.3 | -6.5 | -8.8 | 0.7 | 0.8 | 0.019 |
| 51731.5000 | | -2.8 | 8.010 | | | | -10.8 | | 0.9 | 0.023 |
| 51732.5000 | | -3.2 | 7.176 | | | | -10.4 | | 0.9 | 0.019 |
| 51733.5000 | | -0.3 | 5.737 | | | | -6.0 | | 1.1 | 0.021 |
| 51734.5000 | | -0.7 | 6.180 | | | | -6.8 | | 1.6 | 0.022 |
| 51735.6160 | -0.4 | -4.1 | 6.459 | | 3.7 | -6.9 | -10.5 | 0.6 | 1.1 | 0.023 |
| 51736.5000 | | -4.0 | 6.155 | | | | -10.2 | | 0.8 | 0.029 |
| 51737.6160 | 1.4 | -6.4 | | | 7.8 | | | 0.6 | 1.2 | |
| 51738.5000 | | -7.9 | 3.243 | | | | -11.1 | | 0.8 | 0.015 |
| 51739.6160 | -0.3 | -5.2 | 3.160 | | 4.9 | -3.4 | -8.3 | 0.5 | 1.3 | 0.023 |
| 51740.5000 | | -0.9 | 4.421 | | | | -5.3 | | 1.6 | 0.035 |
| 51741.5000 | | -3.3 | 3.680 | | | | -6.9 | | 1.1 | 0.018 |
| 51742.6160 | 0.7 | -8.6 | -2.175 | - 196794.198 _{CP} | 9.3 | 2.9 | -6.5 | 0.5 | 1.1 | 0.167 |
| 51743.5000 | | -8.2 | | | | | | | 1.1 | |
| 51744.6160 | -2.8 | -5.9 | -11.324 | + 132.993 _{CP} | 3.1 | 8.5 | 5.4 | 0.6 | 0.9 | 0.010 |
| 51745.5000 | | -4.7 | -12.445 | | | | 7.8 | | 0.9 | 0.027 |
| 51746.6160 | -4.9 | -10.8 | -13.195 | | 5.9 | 8.3 | 2.4 | 0.7 | 0.9 | 0.021 |
| 51747.5000 | | -9.7 | -13.027 | | | | 3.4 | | 0.7 | 0.012 |
| 51748.5000 | | -0.7 | -13.191 | | | | 12.5 | | 1.3 | 0.022 |
| 51749.6160 | -6.5 | -2.8 | -13.771 | | -3.7 | 7.3 | 11.0 | 0.6 | 1.1 | 0.016 |
| 51750.5000 | | -10.0 | -13.403 | | | | 3.4 | | 1.3 | 0.013 |
| 51751.6160 | -6.7 | -9.2 | -14.317 | | 2.6 | 7.7 | 5.1 | 0.6 | 1.3 | 0.016 |
| 51752.5000 | | -8.5 | -14.197 | | | | 5.7 | | 1.0 | 0.012 |
| 51753.6160 | -7.4 | -9.2 | -13.619 | | 1.8 | 6.2 | 4.4 | 1.0 | 1.3 | 0.019 |
| 51754.5000 | | -11.9 | -13.803 | | | | 1.9 | | 1.2 | 0.012 |
| 51755.5000 | | -6.3 | | | | | | | 0.9 | |

The ADJUSTMENTS column indicates any manual adjustments (e.g. calibration) that have been applied to either TW, CV, or CP data. In particular, since CP data is currently obtained from non-calibrated systems, arbitrary offsets are often applied to CP data to keep column widths small.

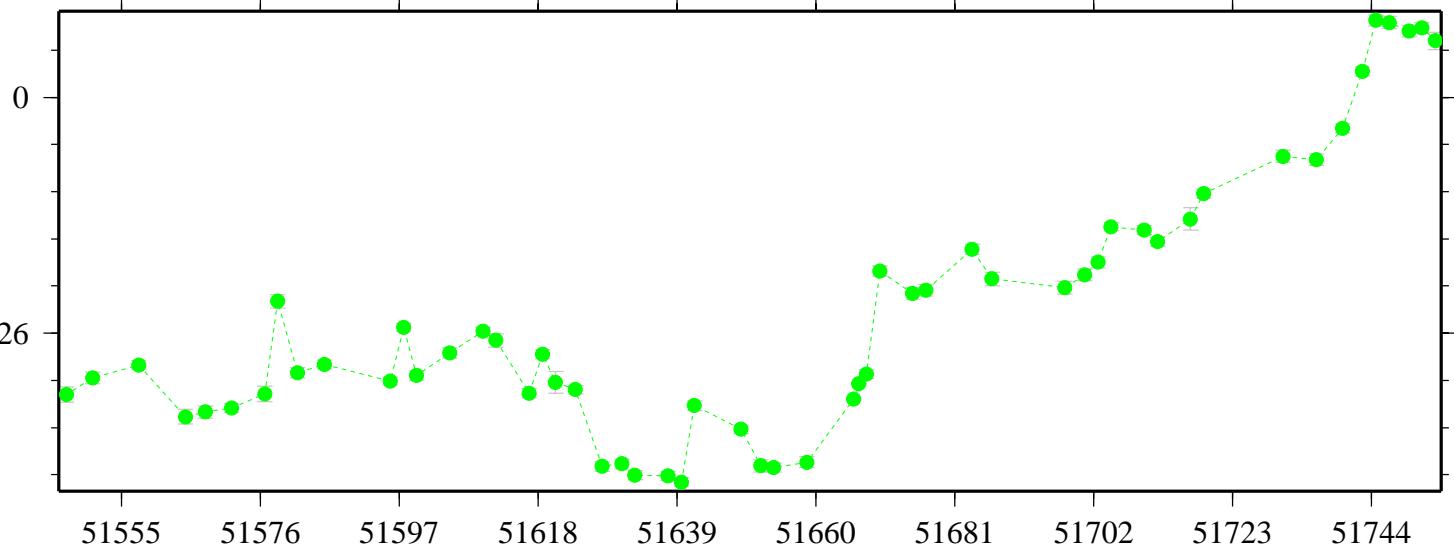
USNO(h)-PTB (TW-CV)

NANOSECONDS



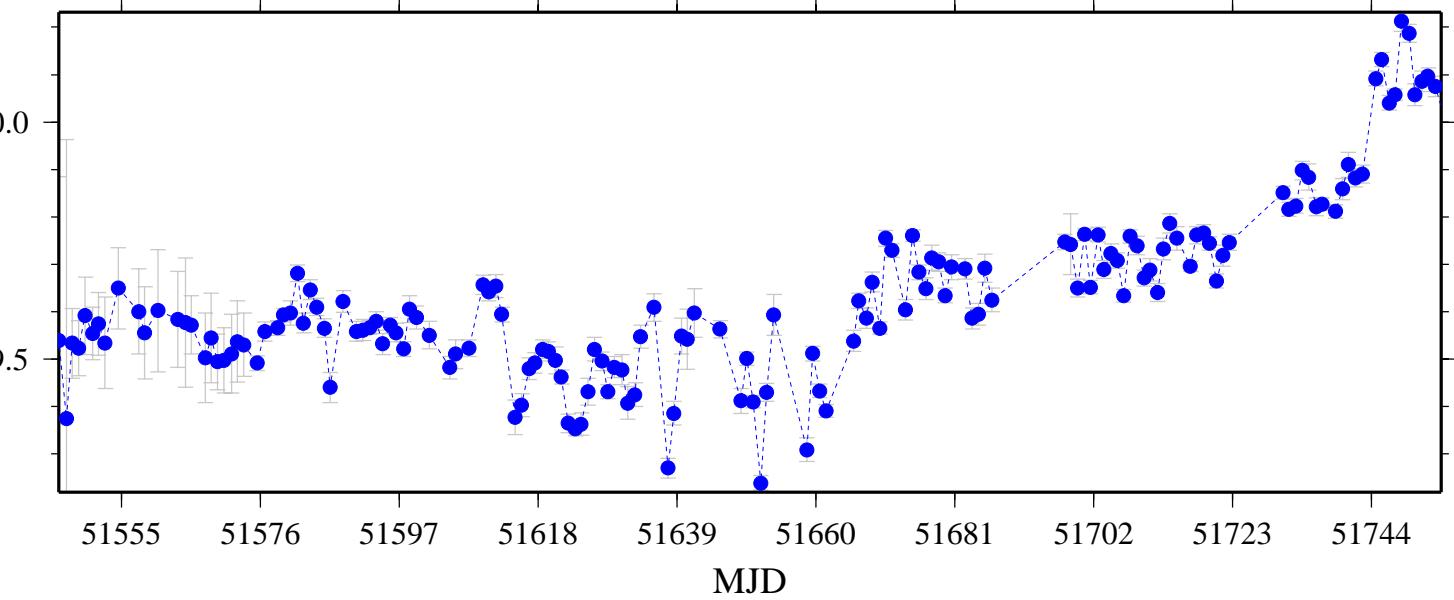
USNO(h)-PTB (TW-CP)

NANOSECONDS



USNO(h)-PTB (CV-CP)

NANOSECONDS



| | |
|------------|---|
| AMC | Receiver System Hardware Information: |
| TW | <p>modem model: AOATWT-1000 antenna: 1.8m-VSAT reference standard name: UTC(USNOAMC(MC1)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): AOA2 SN113 receiver model: AOA-TTR4P antenna: XXX reference standard name: UTC(USNOAMC(MC1)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>AOA2</p> <p>NOTES:</p> <p>Receiver not calibrated.</p> |
| CP | <p>receiver name (local): AMC2 receiver model: AOA SNR-12 ACT antenna: AOAD-M_T reference standard name: UTC(USNOAMC(MC1)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This is an IGS station (AMC2).</p> |

| | |
|------------|---|
| NPL | Receiver System Hardware Information: |
| TW | <p>modem model: SATRE antenna: 1.8m-VSAT reference standard name: UTC(NPL) reference standard type: H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): xxx SN276 receiver model: AOA-TTR5A antenna: XXX reference standard name: UTC(NPL) reference standard type: H-MASER</p> <p>LOGS:</p> <p>XXX</p> <p>NOTES:</p> <p>This receiver system has an arbitrary fixed offset from UTC(NPL) which has not been measured.</p> |
| CP | <p>receiver name (local): NPLB receiver model: Ashtech Z-XII3 antenna: ASH700718B reference standard name: UTC(NPL) reference standard type: H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This receiver system has a fixed offset of UTC(NPL)-1pps_input = (8441+/-1)ns, subject to temperature variations on the 200m cable joining two buildings.</p> |

| | |
|------------|--|
| PTB | Receiver System Hardware Information: |
| TW | <p>modem model: SATRE antenna: 1.8m-VSAT reference standard name: UTC(PTB) reference standard type: CESIUM(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): xxx xxx receiver model: AOA-TTR5 antenna: XXX reference standard name: UTC(PTB) reference standard type: CESIUM(steered)</p> <p>LOGS:</p> <p>XXX</p> <p>NOTES:</p> |
| CP | <p>receiver name (local): PTBA receiver model: modified Ashtech Z-12T GeTT terminal antenna: choke-ring reference standard name: H2 reference standard type: H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This is a GeTT receiver. CP clock estimates at PTB are referenced to UTC(PTB) using data from an SRS620 time interval counter.</p> |

| | |
|----------------|--|
| USNO(a) | Receiver System Hardware Information: |
| TW | <p>modem model: EACS-TWSTT-2000(sn#103) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): AOA1 SN12 receiver model: AOA-TTR4P antenna: XXX reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>AOA1</p> <p>NOTES:</p> <p>Receiver not calibrated.</p> |
| CP | <p>receiver name (local): USNO receiver model: AOA SNR-12 ACT antenna: AOAD-M_T reference standard name: UTC(USNO(MC3)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>CP clock estimates are referenced to UTC(USNO(MC2)) using data from an optic fiber link.</p> |

| | |
|----------------|--|
| USNO(b) | Receiver System Hardware Information: |
| TW | <p>modem model: Mitrex-2500(sn#85006) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): TTR1 SN440 receiver model: AOA-TTR6 antenna: xxx reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>TTR1</p> <p>NOTES:</p> <p>This is the primary USNO SPS common view receiver.</p> |
| CP | <p>receiver name (local): USNO receiver model: AOA SNR-12 ACT antenna: AOAD-M_T reference standard name: UTC(USNO(MC3)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>CP clock estimates are referenced to UTC(USNO(MC2)) using data from an optic fiber link.</p> |

| | |
|----------------|--|
| USNO(c) | Receiver System Hardware Information: |
| TW | <p>modem model: EACS-TWSTT-2000(sn#103) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): AOA1 SNxxx receiver model: AOA-TTR4P antenna: XXX reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>AOA1</p> <p>NOTES:</p> <p>Receiver not calibrated.</p> |
| CP | <p>receiver name (local): USNB receiver model: modified Ashtech Z-12T GeTT terminal antenna: reference standard name: UTC(USNO(MC2)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This is a GeTT receiver.</p> |

| | |
|----------------|---|
| USNO(d) | Receiver System Hardware Information: |
| TW | <p>modem model: Mitrex-2500(sn#85006) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): TTR1 SN440 receiver model: AOA-TTR6 antenna: xxx reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>TTR1</p> <p>NOTES:</p> <p>This is the primary USNO SPS common view receiver.</p> |
| CP | <p>receiver name (local): USNB receiver model: modified Ashtech Z-12T GeTT terminal antenna: reference standard name: UTC(USNO(MC2)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This is a GeTT receiver.</p> |

| | |
|----------------|--|
| USNO(e) | Receiver System Hardware Information: |
| TW | <p>modem model: EACS-TWSTT-2000(sn#103) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): AOA1 SNxxx receiver model: AOA-TTR4P antenna: XXX reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>AOA1</p> <p>NOTES:</p> <p>Receiver not calibrated.</p> |
| CP | <p>receiver name (local): NIM1 receiver model: Ashtech Z-12 antenna: Geodetic 3 reference standard name: UTC(USNO(MC2)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This receiver is owned by the National Imagery and Mapping Agency (NIMA)</p> |

| | |
|----------------|--|
| USNO(f) | Receiver System Hardware Information: |
| TW | <p>modem model: Mitrex-2500(sn#85006) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): TTR1 SN440 receiver model: AOA-TTR6 antenna: XXX reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>TTR1</p> <p>NOTES:</p> <p>This is the primary USNO SPS common view receiver.</p> |
| CP | <p>receiver name (local): NIM1 receiver model: Ashtech Z-12 antenna: Geodetic 3 reference standard name: UTC(USNO(MC2)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This receiver is owned by the National Imagery and Mapping Agency (NIMA)</p> |

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| USNO(g) | Receiver System Hardware Information: |
| TW | <p>modem model: EACS-TWSTT-2000(sn#103) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): AOA1 SNxxx receiver model: AOA-TTR4P antenna: xxx reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>AOA1</p> <p>NOTES:</p> <p>Receiver not calibrated.</p> |
| CP | <p>receiver name (local): NIM2 receiver model: Ashtech Z-12 antenna: Geodetic 3 reference standard name: UTC(USNO(MC2)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This receiver is owned by the National Imagery and Mapping Agency (NIMA)</p> |

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| USNO(h) | Receiver System Hardware Information: |
| TW | <p>modem model: Mitrex-2500(sn#85006) antenna: 4.6m-steerable-vertex reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>NOTES:</p> |
| CV | <p>receiver name (local): TTR1 SN440 receiver model: AOA-TTR6 antenna: xxx reference standard name: UTC(USNO(MC2)) reference standard type: H-MASER(steered)</p> <p>LOGS:</p> <p>TTR1</p> <p>NOTES:</p> <p>This is the primary USNO SPS common view receiver.</p> |
| CP | <p>receiver name (local): NIM2 receiver model: Ashtech Z-12 antenna: Geodetic 3 reference standard name: UTC(USNO(MC2)) reference standard type: steered H-MASER</p> <p>LOGS:</p> <p>NOTES:</p> <p>This receiver is owned by the National Imagery and Mapping Agency (NIMA)</p> |